NOVEMBER
1949

Chemical Engineering

WITH CHEMICAL & METALLURGICAL ENGINEERING

CELANESE IN THE SOUTHWEST—CHEMICAL ENGINEERING ACHIEVEMENT OF THE YEAR. SEE AWARD SECTION, P. 91

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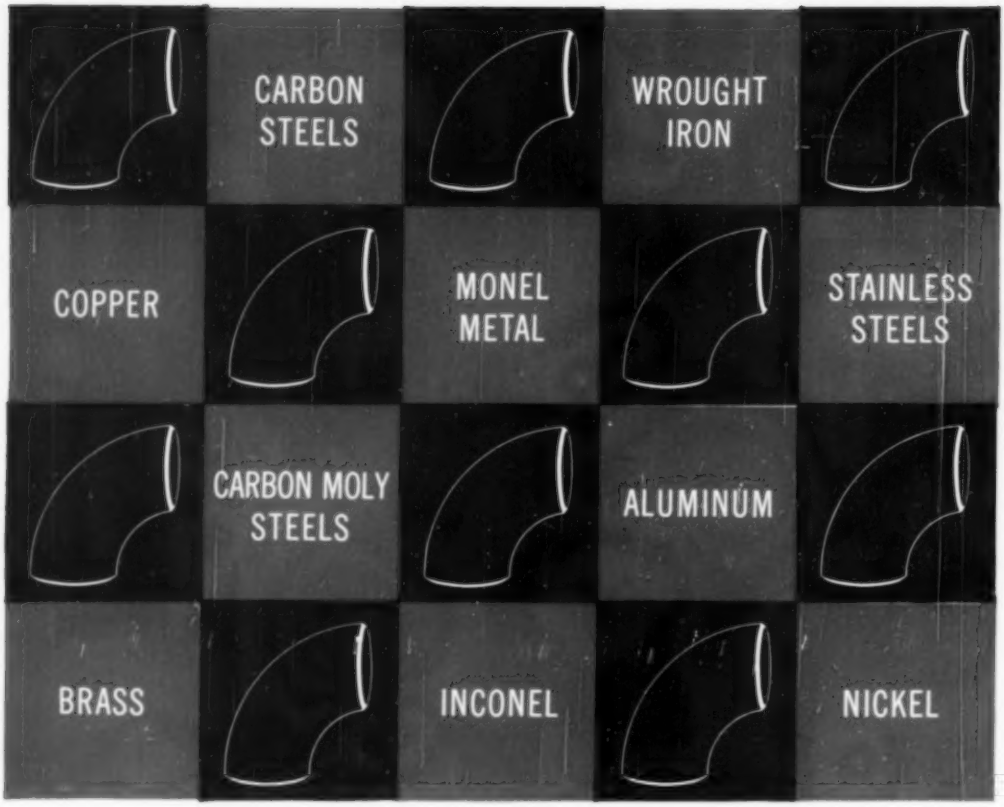

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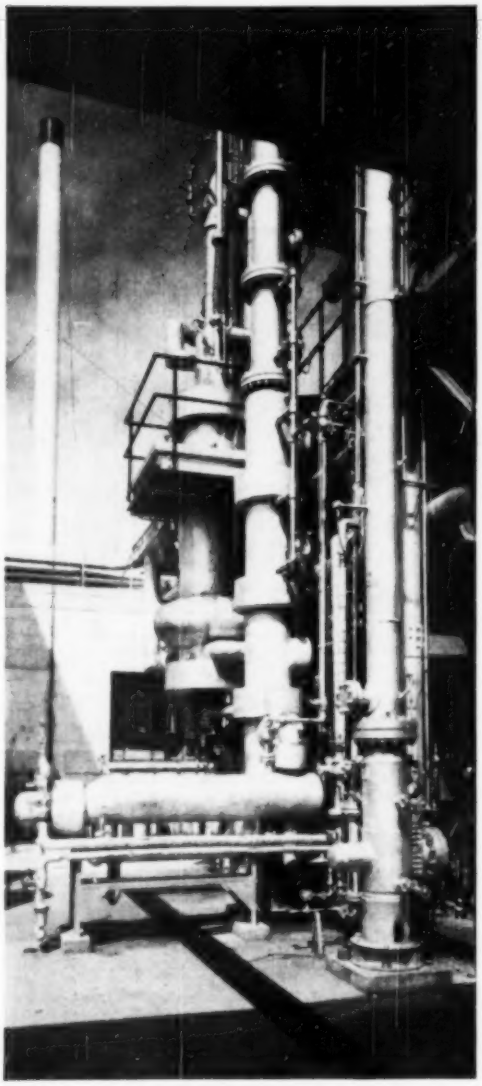


Here you see part of the pilot plant at Emeryville, Calif., where Shell Development Co. is making acrolein by the direct oxidation of propylene. The short thick vertical chamber at the left is the reactor. The vertical columns in the middle and at the right are part of the acrolein recovery system.

Another "First" for Shell

Acrolein is being made by direct oxidation of propylene

Just disclosed is another of those industrially important achievements originating in Shell Development Co., Emeryville, Calif. Shell has demonstrated on a large pilot plant scale, after much fundamental research in the oxidation of olefin hydrocarbons, that acrolein can be made economically by the direct oxidation of propylene, a gas extensively produced in the course of cracking operations in petroleum refineries.

Two or three years ago Shell Chemical Corp. put into operation at Houston a small plant to make this highly versatile aldehyde by the thermal pyrolysis of diallyl ether, a byproduct from other processes. Developments since that time show that the new process of acrolein manufacture is not only commercially feasible but also has the advantage of lower production cost by reason of the lower cost of propylene. The Shell organization is optimistic about the industrial future for acrolein and its many derivatives.

This year Shell Chemical announced a cut in the price of acrolein from $1 per lb. to a new price of 50c. per lb., and announced that the reduction was made primarily to encourage wide investigations leading to new uses. With reference to uses, acrolein is a principal raw material for the manufacture of synthetic methionine, an amino acid of great importance as a food supplement. Considerable work is in progress to widen knowledge of the applications of acrolein derivatives for use in textiles, resins, plastics, surface coatings, pharmaceuticals and other products.

No detailed information about the manufacture of acrolein by oxidation of propylene at Emeryville has been released. However, U.S. Patent 2,451,485 seems to afford some indications of the general process. The patent covers the oxidation of propylene and other olefins, some of which are of considerable current interest to Shell. In broad terms the process described in the patent involves the contacting of an olefin with oxygen or an oxygen-bearing gas in the presence of cuprous oxide or a supported cuprous oxide catalyst. The process is generally applicable to the conversion of olefins of three or more carbon atoms to vinyl-type aldehydes or ketones; it happens that Shell Development is producing small experimental quantities of methacrolein, which can also be produced by the process.

Shell Development is making available on a limited experimental scale for companies interested in determining new applications for acrolein a number of acrolein derivatives. These include beta-methoxypropionic acid; 3-methoxy-1-propanol; tetrahydropyran-2-methanol; 1,2,6-hexanetriol; 3,4-dihydro-2h-pyran-2-carboxaldehyde; alpha-hydroxyadipaldehyde; beta-methoxypropionaldehyde and allylidene diacetate.

L.A.'s New Water Unit Percolating

A large new consumer of chemicals has begun percolating near Los Angeles, where the Los Angeles Metropolitan Water District has put into operation a $4 million water filtration and softening unit having a daily capacity of 100 million gallons. This unit doubles the capacity of the combined plant at La Verne to a total of 200 million gallons daily.

Chemicals in large quantities are used in the new unit. In round numbers the annual estimated figures are: 50,000 tons of rock salt, 2,100 tons of lime, 500 tons of ammonium sulphate, 100 tons of soda ash, 200 tons of chlorine and 1,800 tons of sodium silicate. The 12 zeolite beds are each 21 ft. wide by 30 ft. long.

Fluor to Push Sulphur Plants

Fluor Corp., Ltd., of California has concluded an arrangement with Mathieson Chemical Corp. whereby Fluor has sole rights to erect sulphur recovery plants in this country and Canada based on Mathieson's processes for recovery of sulphur from hydrogen sulphide gases and acid sludge or other sulphur-containing petroleum refinery waste materials. Fluor sees excellent prospects for the expansion of such installations in the West, which would serve the purposes of recovering sulphur, reducing wastes and eliminating sources of certain types of industrial pollution.

Under the agreement Mathieson will authorize the use of its sulphur processes only to firms nominated by Fluor and will supply technical information as well as the services of technicians to assist in the design and operation of plants. Fluor will build the plants which Mathieson will require for its own use, and will be designated for the construction of such plants for other owners.

Last March Mathieson got into the sulphur and sulphuric acid business in a large way when it purchased the business and assets of Southern Acid & Sulphur Co. The latter's plants are scattered throughout the Southwest. Two plants in Arkansas recover sulphur from "sour" natural gas.

Phillipson Proves Retort Process

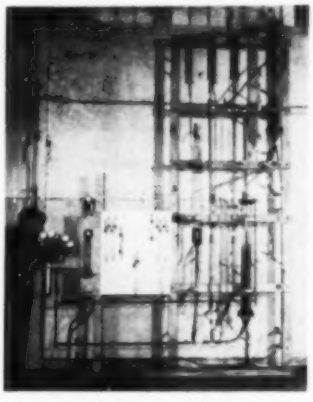
At Eugene, Ore., Phillipson Retort Manufacturing Co. has announced that on the basis of proved feasibility of retorting wood wastes, a commercial-scale plant to manufacture charcoal will be built to supply the product to consumers in the Northwest, an area where most industrial carbon has to be brought in from other regions.

Engineer Carl Levy says the project calls for expenditure of around $100,000 to erect a unit capable of producing 50 tons of charcoal per 24-hr. day from dry wood slabs and sawdust. It is expected that provision will be made to recover the oils and vapors resulting from the retorting.

Operation of the company's pilot plant, capable of turning out 6 to 8 tons of charcoal per day, has been carried out in cooperation with the Oregon Forest Products Laboratory and University of Oregon. The process was developed by the late H. S. Phillipson.

Wood waste enters the top of the retort and drops through three troughs as it is moved by screw conveyors. By regulating the speed of the screws the volatile content of the final product can be adjusted. Three stages are involved: driving off moisture, decomposing the wood and cracking primary tars to form additional charcoal.

It has been estimated that the annual wood waste of Douglas fir alone in the Pacific Northwest is around 4,200,000 tons, and that 2,000 lb. of this material should yield 600 lb. of charcoal, 500 lb. of tar, 350 lb. of acid liquor and 550 lb. of fixed gases.



Laboratory unit used at SRI for studying process development: carbon and chemicals from wood by fluidization.

SRI Has Mushroom Growth

Stanford Research Institute, non-profit, applied research organization at Stanford, Calif., observes its third birthday this month, and one of the busiest and most prolific groups is its department of chemistry and chemical engineering. During the last 12 months around 50 percent of the institute's projects, dollarwise, have been in the field of that department. The department has some work under way that is of potential commercial importance.

SRI is today operating at a rate of around $2,000,000 annually, with a monthly volume only several thousand dollars short of the entire return during the first year of operation. Three years ago the new organization occupied three rooms in the physics building on the Stanford University campus, but now has mushroomed into its own quarters in a group of buildings having 45,000 ft. of floor space for laboratory and administrative work.

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Under way in the chemistry and chemical engineering department are some projects that bid fair to have important commercial applications. One of the most interesting, a project which the institute itself originated, is a continuous ion exchange process. This is regarded as one of the most noteworthy undertakings on SRI's current docket. If expectations are fulfilled that it will materially reduce the cost of capital equipment now involved in ion exchange systems operating on the cyclic principle, it may have a significant bearing on the future spread of the ion exchange process as applied to the refining of beet sugar and numerous other chemical process operations.

Another development under way is the adaption of the fluidized solids technique, used widely in petroleum refining, to the manufacture of industrial carbon and chemicals from wood and wood wastes. The process worked out at Stanford is considered economically sound and would be attractive for the production of high grade charcoal and chemicals, particularly phenolics, from the large quantities of redwood wastes on the Pacific Coast.

Tacoma Gets Copra Plant

Tacoma Vegetable Oils, Inc., is the name of a new firm that expects to get into the manufacture of coconut oil and meal early in 1950. The company plans to import annually 36,000 tons of Philippine copra to its $500,000-plus plant at Tacoma and to produce in addition to oil approximately 12,000 tons of oil meal. This product will be marketed locally as a stock and poultry feed. Present plans are that the oil will be sold to eastern soap makers.

E. L. Westenhaver is vice president in charge of operations for the new plant.

Permanente Cement Booms

Reopening of a packhouse at Seattle, and reported decision to build a sacking plant at Anchorage, Alaska, reflect a boom in the Pacific Coast business of Permanente Cement Co. The consolidated net profit in operations for the quarterly period ending July 31 was more than 75 percent greater than similar earnings during the first quarter, and represented the highest quarterly earnings in the company's history.

The company has reopened its Duwamish plant at Seattle, formerly used for standby cement storage. The installation includes the packhouse with a capacity of 40,300 sacks per day and storage silos for 80,000 bbl. Cement is received from the company's two bulk cargo carriers bringing the product from Permanente's cement plant near Santa Clara, Calif.

The company has withheld comment on a statement from the Alaska Development Board that the firm plans to begin the construction of a 100,000 bbl. per day sacking plant on the waterfront at Anchorage next spring. The plant will be used, according to the report, to sack cement for shipment throughout Alaska.

Alaska to Get Big Pulp Mill

Alaska's first pulp mill is about to emerge from the dream state, and take on the brisk look of reality. With property negotiations near completion, the Ketchikan Pulp & Paper Co. expects to start construction of the long planned $30,000,000 high alpha pulp mill at Ward's Cove near Ketchikan next spring, according to chief engineer Harold Cavin. Negotiations have been completed for waterfront property which will give the company continuous waterfront before the mill site, but two more pieces of property still are sought.

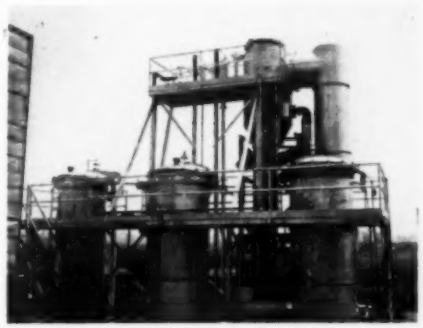
About a year ago, Ketchikan Pulp & Paper Co. made a successful bid to the United States Forest Service on 1.5 billion cubic feet of standing timber in southeastern Alaska's Tongass National Forest. The firm is controlled by Puget Sound Pulp & Timber Co., long interested in tapping the Alaskan pulp source. American Viscose Corp., a big-time buyer of rayon-grade pulp, is associated with Puget Sound in the ownership.

Engineering work on the 300-ton pulp project has been under way for some time, though dates for initial construction have been withheld. Ultimate capacity is expected to be 500 tons.

Ketchikan's contract with the Forest Service will last 50 years, starting in 1952. By that time the 1.5 billion cubic feet will have grown into 8 billion. Prices agreed upon by the new pulp company were 85c. per 100 cu. ft. of pulp timber cut prior to 1962, $3 per 1,000 b. ft. of spruce cut for purposes other than pulp, $1.50 per 1,000 of cedar and $2 per 1,000 for saw logs of hemlock and other species.

If takers are found for the other six available stands in Alaska, this country's independence in pulp stock will be greatly enhanced—a situation Uncle Sam is keenly in favor of since this country has depended heavily on Scandinavia for pulp stock.

Currently Ketchikan Pulp & Paper struggles with road building. Says Engineer Cavin, "It looks like we'll get going on the mill as soon as the road problem is out of the way."



New Concentrator in Operation

A new type, triple effect concentrator having interesting potentialities in low-temperature chemical processing applications, particularly pharmaceuticals, has been put into operation for concentrating orange juice by Real Gold Citrus Products at Anaheim, Calif. A second installation of this type of equipment may be built in the near future for the production of aromatic oils by a firm at Los Angeles.

Convinced of the merits of the new concentrator, Carrier Corp. has moved to acquire control of the C. E. Howard Corp., successor to C. E. Howard Co., South Gate, Calif., and to join C. E. Howard Corp. in the manufacture of the equipment. E. J. Kelly, chief engineer of Howard, was instrumental in developing the concentrator with the collaboration of Carrier Corp. Howard Corp., with George N. Lilygren as president, will manufacture the equipment for the 11 Western States, and Carrier will produce it for other areas.

Carrier intends to develop its new concentrator business aggressively not only in the citrus field but in other food and chemical and pharmaceutical lines. E. J.

Kelly, the designer, says that "the new concentrator provides substantial reduction in owning and operating costs due to several unique features. Utilizing high vacuum in conjunction with a conventional refrigeration cycle, the material being concentrated in a continuous cycle provides its own heat for evaporation, the refrigeration equipment being used merely to transfer heat. As applied to citrus juice concentration as well as to other concentration processes, the temperature of the material being concentrated is never above that at which it enters the process.

"This is of the utmost importance in the retention of vitamin and flavor constituents. However, the flexibility of the concentrator is such that it may be applied to concentration or evaporation processes requiring substantially higher temperatures or extremely low temperatures."

Object: Higher Learning

Preliminary drawings for a $5,000,000 chemistry-geology building on the Los Angeles campus of the University of California have been accepted by the Regents. Funds have already been appropriated.

The new chemistry-geology building will have 150,000 sq. ft. of "net useful" floor area—about 68 percent of it for chemistry. The six-story structure will house laboratories for radiation and physical chemistry, quantitative analysis, and instrumentation. One complete floor will be devoted to research labs; another, organic chemistry instruction; and a third to biochemistry.

The 90 percent increase over present chemistry instruction capacity will be largely in senior-college and graduate school levels. Already almost two-thirds of the new entering students are transfers with advanced standing, and only one-third are freshmen. California junior college system will handle freshman chemistry instruction. Within a few years it is expected that freshman and sopohomore courses will be operated on a relatively small scale as an educational pilot plant.

Alcoa Expands

Construction has begun on the Aluminum Co. of America's new multi-million dollar fabricating plant adjacent to the company's reduction plant on the Columbia River waterfront at Vancouver, Wash. Products of the new plant, to be in operation early in 1950, will be aluminum transmission cable, high strength aluminum wire and rod, and screw machine stock.

Grading for the project has been completed and L. H. Hoffman Construction Co., Portland, has begun driving piling to support the heavy rolling and drawing equipment required by the new mill. With this new addition, Alcoa's Vancouver works will have seven acres under roof.

The company has announced that C. S. Thayer, present works manager for the Vancouver reduction operations, will become over-all chief of the entire works, with the title of manager of Vancouver operations. The present plant will become the reduction division of the Vancouver works.

Operating officials of the new mill will be headed by E. D. Mairs, assistant works manager of the fabricating division of Alcoa's Massena, N. Y., works. R. W. Knapp, melting department superintendent at Newark, Ohio, will become assistant works manager of the fabricating division, and R. H. Sloan, who has been production superintendent of the Vancouver works, becomes works manager of the reduction division, with C. T. Heins, his assistant.

Potlatch Opens Veneer Plant

Potlatch Forests, Inc., has opened at Lewiston, Idaho, its new $1,250,000 veneer plant after making trial runs this summer. Idaho white pine and ponderosa pine are the raw materials. Capacity is about 7,500,000 ft. of single ply veneer per month. Plant superintendent is Philip Remmuth.

Kaiser Gypsum Reaches Out

Confronted with the pleasant problem of demand outstripping supply facilities, Kaiser Gypsum, a division of Kaiser Industries, Inc., has acquired the gypsum products plant at Redwood City, Calif., formerly operated by Pacific Portland Cement Co. The newly purchased plant and that of Standard Gypsum Co. of Calif. (Kaiser affiliate) at Long Beach, Calif., will be owned and operated by Kaiser Gypsum from now.

The plant at Redwood City will be extensively modernized to produce a complete line of gypsum products for distribution in northern California, western Nevada, Oregon and Washington. Gypsum will be supplied from the company's quarry on San Marcos Island, off the coast of Baja California.

Idaho on New Phosphate Trail

A new low-cost method for processing Idaho's phosphate rock is being worked out in the chemical engineering department, University of Idaho. The investigation is headed in the direction of developing a better method of manufacturing superphosphate and to the production of a more concentrated form of phosphate fertilizer, possibly elemental phosphorus for movement to distant markets.

C. O. Reiser, head of the chemical engineering department, is leading this work, which because of its potentialities, involves the school of mines and the college of agriculture.

Most commercial processes operate more efficiently on ores of a relatively high phosphorus content. Investigations show, however, that grinding and classifying operations will bring much of the low-grade deposits up to the class of high-grade material, upon which the state's estimated reserve of 5.5 billion tons is predicated. There is the prospect that the new development may increase this figure two or three times.

Crown Sows Bumper Seed Crop

Paper manufacture, one of the West's major chemical process industries, faces the stern fact that its future is dependent on the rate at which tree farming will keep pace with the increasingly mechanized decimation of the Northwest's slow-growing forests. Blessed with a bumper crop of cones on its eight tree farms this season, Crown Zellerbach Corp. is doing two things to assure its pulp and paper mills a supply of timber 30 years hence.

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75 YEAR

Right now the company is broadcasting seeds from helicopters over 5,200 acres of logged or burnt-over lands in Washington and Oregon. Two previous years of planting via air has proved this method. The restocking program covers lands serving Crown Zellerbach's mills at Camas, Wash., and West Linn and Lebanon, Ore. It is part of the company's plan to attain true sustained yields for its 500,000-acre area of tree farms.

For tomorrow's plantings the company is placing part of the bumper seed crop (mostly Douglas fir and hemlock) in deep-freeze storage. This will be drawn upon as insurance against the lean years when seed production falls below the planting schedule.

Annual growth of the tree farms is about 600,000 cords, roughly equal to 30 carloads of paper each 24 hr.

New Industry for Idaho?

In the gold fields of Idaho the heavy black sand found in copious quantities contains large reserves of monazite, which in turn carries, in varying amounts, around 15 rare earth metals that might become the basis for a new industry for the state. Tailings from gold mining operations alone represent hundreds of thousands of tons of the mineral, in which is present such elements as cerium, lanthanum, neodymium, praseodymium, samarium and thorium.

The University of Idaho is endeavoring in its chemical engineering laboratory to develop a method for the chemical separation of these metals with a view to establishing the process on a commercial basis. Engaged in the project are L. A. Jobe, professor of chemical engineering, and Donald T. Bray, research fellow in the department. They have worked out new procedures for analyzing the sands. Monazite is being furnished for the investigation by Rare Earths, Inc., a new company that is separating monazite from its accompanying impurities.

New Distillery for Canada

Alberta Distillers, Ltd., has opened at Calgary, Alberta, a $1.5 million distillery. It is considered to be the only plant of its kind in Canada, using natural gas as fuel. Estimates show that gas requirements will total about $41 per day as compared to around $180 daily if coal were fired. Daily gas consumption is 350,000 ft.

Present output is 100 bbl. per day. There is some prospect that a future expansion will lift daily capacity to about 11,000 gal. Two additional rack houses and a bottling plant may be added later, at an estimated cost of $450,000. Equipment for the present new plant was manufactured entirely in Canada and was designed to facilitate future expansion.

Matches—Paper Get Together

One of the world's largest match firms, the E. B. Eddy Co., of Canada, and a leading British Columbia paper, roofing and box concern, the Sidney Roofing & Paper Co. Ltd., of Vancouver and Victoria, have consolidated financial operations. Controlling interest of both firms has been held for some time by Garfield Weston, prominent Canadian and English financier.

Sidney Roofing manufactures paper, paperboard, roofing and other building materials at Victoria and is distributor in western Canada for various insulating materials, wallboards, floor tile, sidings and similar products.

The change will not affect operations of Sidney, or its wholly-owned subsidiary, National Paper Box Co. at Vancouver; it merely carries out a consolidation of controls.

Mr. Weston is chairman of both firms; W. S. Kidd, is president of E. B. Eddy; and Hon. R. W. Mayhew, member of parliament for Victoria and Dominion minister of Fisheries, is president of Sidney Roofing.

Only recently, the Eddy company bought Western Match Co. Ltd., of Victoria for $210,000. Eddy already operated a match plant at Mission, in the Fraser Valley.

Cement Plans

The Superior Portland Cement Co., Seattle, is operating again at the Diamond Cement plant.

Superior Portland operated the plant for many years under a lease which expired the end of 1946. It had an option to buy, but let its option lapse because the Pacific Coast Cement Co., owners of the plant, refused to sell for less than $2,500,000.

Much later Superior Portland discovered the plant had been sold to Permanente at a substantially lower figure —they brought suit declaring that to be an agreeable price with them also. Superior Portland lost in superior court but won in the state supreme court last April.

Latest report indicates no immediate changes in the plant operating features.

Cold Rubber for Canada

First operational tests in Canada on "cold rubber," new synthetic product that may make possible manufacture of tires superior to those of natural rubber, are being conducted by the B. C. Electric Railway Co., Ltd., Vancouver, B. C.

With 1,000 lb. of the new material on hand from General Tire and Rubber Co. of Akron, Ohio, product supplier, the BCER's maintenance men are recapping bus and trolley coach tires on an experimental basis for trial under all types of operating conditions.

Results of the tests now being carried out will be considered official and final by rubber companies in Canada and will take the place of tests they would otherwise conduct themselves. Data obtained will be made available to other companies upon request.

A modification of GR-S—standard synthetic rubber developed during World War II—cold rubber has been on the market for only a few months. It is now being produced at the U. S. Government plant at Baton Rouge, La., and at the Canadian Government plant at Sarnia, Ont.

In the process of manufacturing cold rubber, butadiene and styrene, two common organic chemicals, react to form chemical rubber when emulsified with soap and water at 122 deg. F. By reducing the temperature to 41 deg. F., a tougher rubber is produced, its main uses being in making tires and recapping material.

B. C. Electric Co.'s transportation division first became interested in the new substance after tests showed that it had a longer wear resistance even under conditions of severe flexing than natural rubber. Recorded mileages per tire were also substantially greater.

The BCER, first transit company in Canada to embark on this experiment, also was the first Canadian utility to adopt the process of recapping tires back in 1935, and was selected to receive the first GR-S rubber for commercial testing in Canada early in 1943.

Anaconda Increases Triple Super

Anaconda Copper Mining Co. at Anaconda, Mont., has put into operation additional facilities to increase its output of triple superphosphate from the former rate of 60,000 tons annually to 100,000 tons. The plant is also manufacturing 10,000 to 15,000 tons per year of phosphoric acid, which is marketed largely in California and Arizona as a fertilizing agent added to irrigation water.

NAMES IN THE WEST

William G. King Jr., assistant general sales manager, has been elected vice president of Richfield Oil Corp. and appointed general sales manager of the corporation, succeeding the late William T. Dinkins. Mr. King, associated with Richfield for the past 20 years, entered the oil business as a distributor of Richfield products in Seattle. He has served in the home office in Los Angeles as assistant general sales manager since 1946.

John H. Ballard and **Paul B. Stewart** are newly appointed assistant professors of chemical engineering at the University of Southern California. Ballard has had several years of industrial experience with the Union Oil Co. of Calif., while Dr. Stewart has been associated with Du Pont.

E. G. Hallonquist, formerly in charge of the development division of the Plywood Research Foundation at Tacoma, Wash., has been appointed to the research staff of the Institute of Technology at Washington State College, where he will head a new laboratory and pilot plant. He has had 16 years experience in cellulose chemistry.

R. G. Greene has been appointed Union Oil Co.'s manager of exploration, Pacific Coast, and will be responsible for both exploration and land activities.

William H. Beckhuis was elected vice president of Standard Oil Co. of California, September 30. An economic counselor, he has acted as secretary of Standard's executive committee for the past six months. He has been associated mainly with the company's manufacturing activities, since his graduation from the University of California in 1930.

John W. Miller has been appointed superintendent of production planning at the Kaiser Steel Corp., Fontana, Calif. He succeeds **Tom Jones**, resigned. Mr. Miller came to the Kaiser plant in early 1945, as assistant to the general superintendent. Previously he had held various managerial posts at the South Chicago plant of Carnegie-Illinois Steel Corp.

T. James Rich has resigned as director of research for the Mission Dry Corp., and has accepted a "special" research assignment with Gentry, Inc., Los Angeles.

Norris Johnston, formerly chief physicist in charge of production research for General Petroleum Corp., has become president of the consulting firm, Petroleum Technologists, Inc., Montebello, Calif.

J. B. Taylor, Jr., Signal Oil & Gas Co., has been elected president of the California Natural Gasoline Association.

Harold Q. Noack has been named division vice president, central sales division, of Columbia Steel Co. Mr. Noack, who recently joined Columbia as assistant to vice president Pringle, will direct sales functions in central and northern California.

John F. McGarry, formerly assistant superintendent of the Shell Chemical Co. plant at Houston, Tex., has become associate professor in charge of the process engineering subdivision, college of engineering, University of California. He joined Shell Oil Co. in 1933 and was transferred to Shell Chemical in 1943, after which he was in charge of process design in San Francisco and New York.

Robley A. Butler has been appointed technical control supervisor at the Ocean Falls division of Pacific Mills, Ltd., Vancouver, B. C., according to P. E. Cooper, president of the company. Mr. Butler graduated from Oregon State College in 1939, and has been engaged in a technical capacity with Crown Zellerbach Corp., for several years.

James W. McBain, consultant on chemistry to Stanford Research Institute, left September 25 to assume duties as director of the National Chemical Laboratories of India. Buildings to house the laboratories have been completed at Poona, 100 mi. inland from Bombay. Dr. McBain has been with the institute since 1947, and led research on the fundamental study of liquid surfaces.

Howard B. Nichols has been elected a director, vice president and executive committee member for California Texas Oil

Stauffer

Fleets of Stauffer tank trucks are now available to deliver industrial acids in bulk in California and the Pacific Northwest.

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Co. He was also named a director of Bahrein Petroleum Co.

Chester C. McMillan has been appointed chief sales engineer of the chemical division of Portland Shingle Co., Portland. He will be responsible for development, sales and manufacture of the firm's new product, Borgana, as well as supervising the technical training program. Originally from Neponset, Ill., McMillan spent some time with the Naval Research Laboratories, Washington, D. C.

Ronald B. Hayes has joined International Minerals and Chemical Corp. to head its monosodium glutamate educational program. He was previously associated with Spreckels Sugar Co. for 14 years.

Robert E. Bundy has become vice president in charge of production and **B. P. Altick** named assistant to the general manager of Fibreboard Products, Inc. Bundy succeeds **N. M. Brisbois**, retired and at present a consultant for the company.

John E. Hanna has been appointed manager of the engineering department of Pioneer Rubber Mills in the Pittsburg, Calif., factory. A graduate mechanical engineer from the University of Southern California, he first joined Douglas Aircraft Co., then entered the Navy. After leaving the Navy in 1946 he joined the Bechtel Corp. and worked on the design of petroleum processing plants.

American Blower Corp., Detroit, will erect a manufacturing and assembly plant at San Leandro, Calif. Company has purchased a 10-acre site upon which it will immediately construct an initial production unit covering 40,000 sq. ft. Initial investment will exceed $400,000. Operation will produce heating, cooling, drying and ventilation equipment as well as gyrol fluid drives for power in industry.

Van Russel Gaertner, organic research chemist for the National Institute of Health project at Ohio State University, has been appointed assistant professor of chemistry at University of Oregon.

Alan R. Mellis has been placed in charge of the industrial locations section of the Portland Chamber of Commerce industries department. He will fill the position made vacant by the resignation of **Paul D. Christerson**, who has joined Pope & Talbot Co. Mr. Mellis is a graduate of Oregon State College.

Harold C. Miller, supervising engineer for the Bureau of Mines petroleum field service office, San Francisco, has been named regional director of Region III. That regional office is being established at San Francisco.

H. J. Lilleston, vice president of Paraffine Companies, Inc., is returning to San Francisco after several years in New York. He will supervise marketing, advertising and merchandising of all products in Paraffine's domestic division.

Paul A. Best has become assistant to the president of California Oil Co., subsidiary of Standard Oil Co. of California, San Francisco.

FIRMS IN THE WEST

Desert Star Products, 4500 North Central Ave., Phoenix, Ariz., has been established by Leon Yablon to manufacture and process table and fountain sirups. The owner plans to extend distribution to Tucson and export to Mexico in the near future.

Eagle Oil & Refining Co., Los Angeles, are laying plans for the purchase of controlling stock and interest in Sunset Oil Co. Thomas F. Fournier, president of Sunset Oil Co., also a Los Angeles firm, says a sale will be completed soon.

Gordon Chemical Products, Inc., moved from 114 North Western Ave., Los Angeles, to new and large quarters at 838 East Jefferson Blvd., Los Angeles 11. New building is approximately 5,000 sq. ft. Company manufactures wood and wall sealers, paint thinners and paint remover.

Pittsburgh Agricultural Chemical Co., a division of Pittsburgh Coke & Chemical Co., has established a regional warehouse and sales office in Denver. E. C. Stone is in charge of the Denver office.

Griffith Rubber Mills has established a specialties sales division at Portland. As head of the new division, L. R. Bigler, formerly with Aluminum Co. of America, will be in charge of merchandizing the firm's consumer products developed by the company during the last few years.

Atlas Imperial Diesel Engine Co., after a few months of operation of its $1 million glass plant at Hayward, Calif., is turning out 240,000 containers per day, representing around 50 percent of capacity. Two lines are in operation, and another is expected to begin operating next spring.

Riders, Ltd., moved from 12309 Emelita to 7234 Varna Ave., North Hollywood, and increased their space to 16,000 sq. ft. Company makes pharmaceuticals and cosmetics to specification; also put up the Oculine Products and Dybasik Ammoniated Tooth Powder.

Smith, Davidson & Wright, Ltd., of Victoria, Nanaimo, Calgary and Edmonton, one of the largest wholesale paper houses in Western Canada, has been purchased by the H. R. MacMillan Export Co. Fred Smith, founder of the paper company continues as president. John Lecky is general manager.

Kaiser Fleetwings, Inc., has been renamed Kaiser Metal Products, Inc. Henry J. Kaiser, chairman, says the change of name results from a conversion that has taken the company out of the manufacture of aircraft components and into the production of consumer goods and automobile parts.

American Blower Corp., Detroit, has announced that negotiations have been completed for a manufacturing and assembly plant to be located at San Leandro, Calif. The company manufactures a wide range of equipment including air handling and conditioning equipment. Operations at San Leandro are expected to begin early next year.

Gladding, McBean & Co. has closed its fire brick plant at Livermore, Calif., and has transferred its operations to the refractories plant the company has at Pittsburg, Calif. The company plans to centralize all refractory research there. Its research laboratories at South Gate, Calif., will be moved to Pittsburg. James W. Mahoney, vice president, has been named general manager of the company's Central Division with headquarters at San Francisco. Mahoney succeeds C. W. Planje, who has been named vice president and assistant to the president, with offices in San Francisco.

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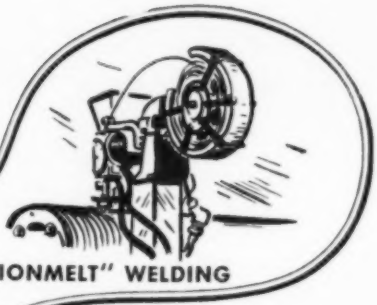

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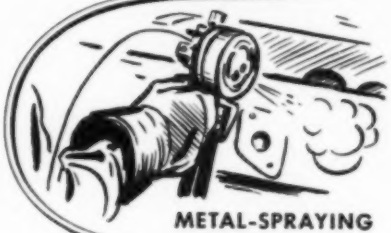

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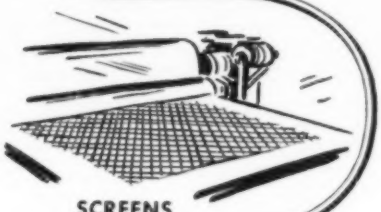

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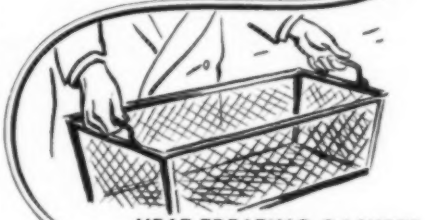

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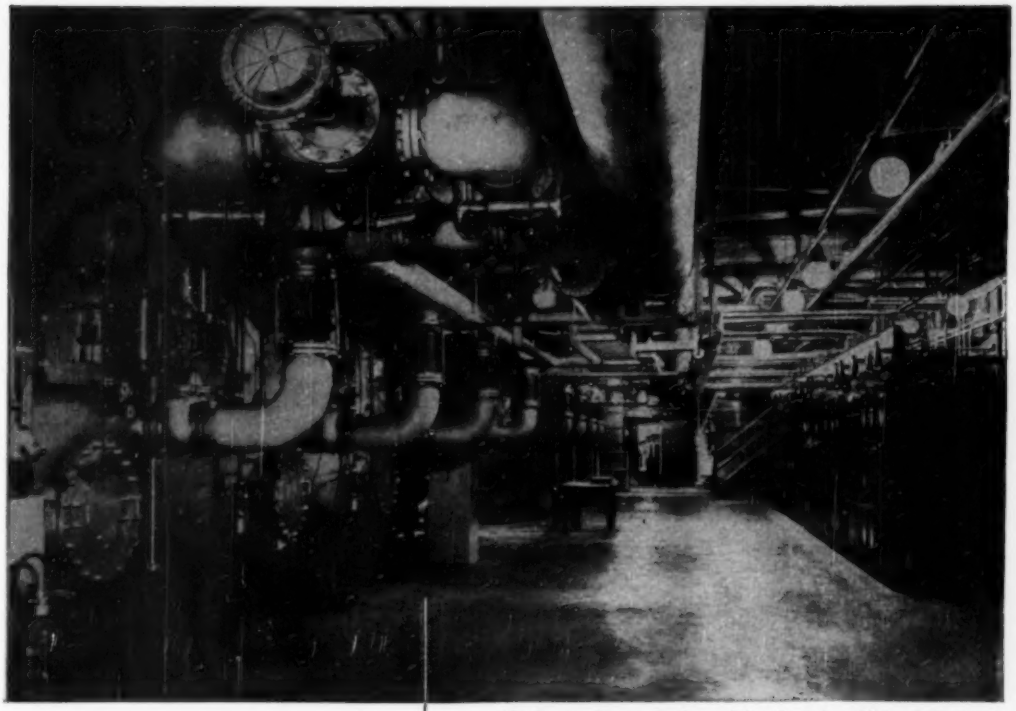

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Superstructure Bolted to Valve Body Bonnet	YES	NO Locking collar on stuffing gland	NO Set screws	YES
Bolted Stuffing Box All Sizes	YES	NO Optional—extra charge	NO Optional—extra charge	NO Optional—extra charge
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Valve Action Reversible No additional parts	YES	YES	NO	YES
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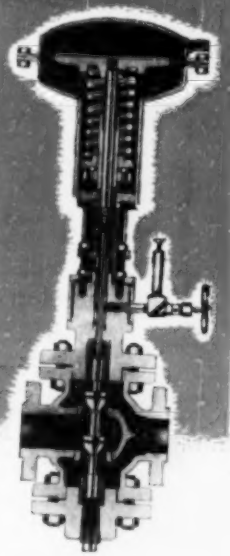

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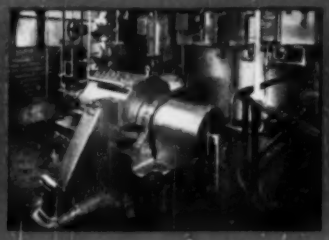

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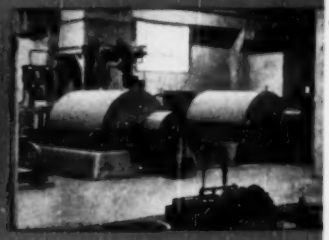

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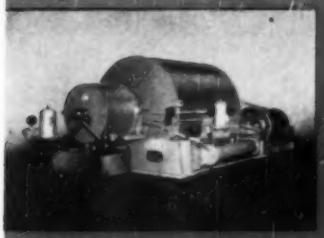

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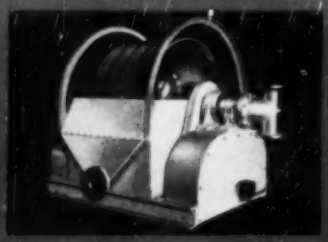

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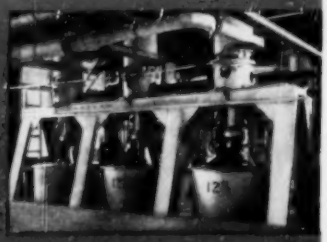

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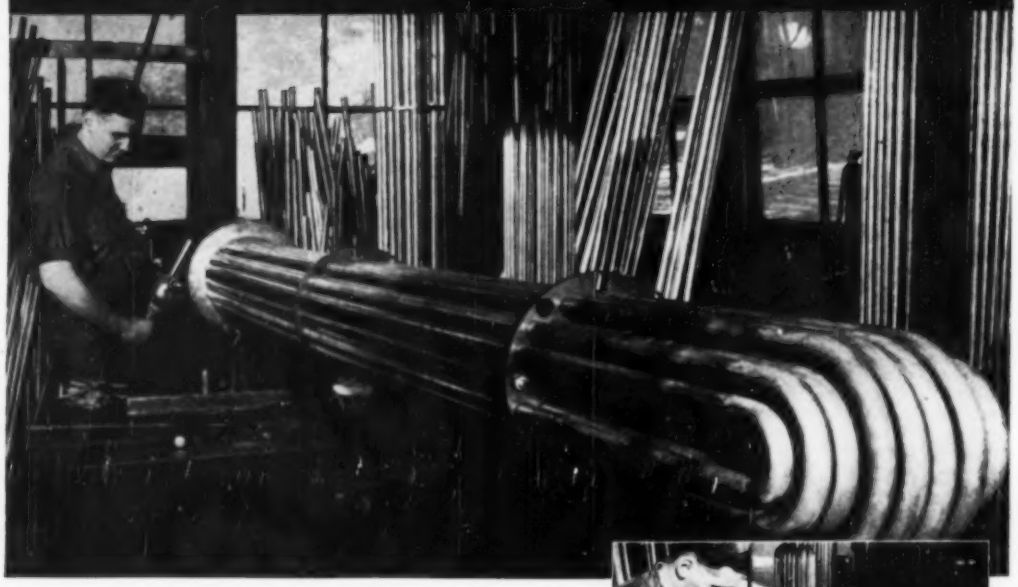
of Special Bending Temper . . .



. . . saves bending time, enables WESTERN BLOWER CO. to produce neater, more uniform tube bundles.

During the past nine years, Western Blower Co., of Seattle, Wash., has used hundreds of thousands of feet of $\frac{3}{4}$" and 1" O.D. Revere Seamless Copper Tube of special bending temper, with .049" wall.

They tell us that in working with this Revere Tube they are able to make large and small radius bends without the slightest difficulty and without heat treating, excepting the smallest 1" radius. This not only saves bending time but, enables them to turn out a better appearing tube bundle . . . an important item with Western Blower as many of their bundles are sold without tanks.

In addition to the above, this company has also used tens of thousands of feet of Revere Cupro-Nickel Tube in heaters where salt water was a problem. For this metal, which is one of the most corrosion-resistant of the copper nickel alloys, can withstand high operating temperatures and is not subject to dezincification.

Have you investigated the Revere metals to see how they might help you with your tube problems? Why not have Revere put the knowledge and experience, gained through years of helping others, to work for you? Call the nearest Revere office today.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

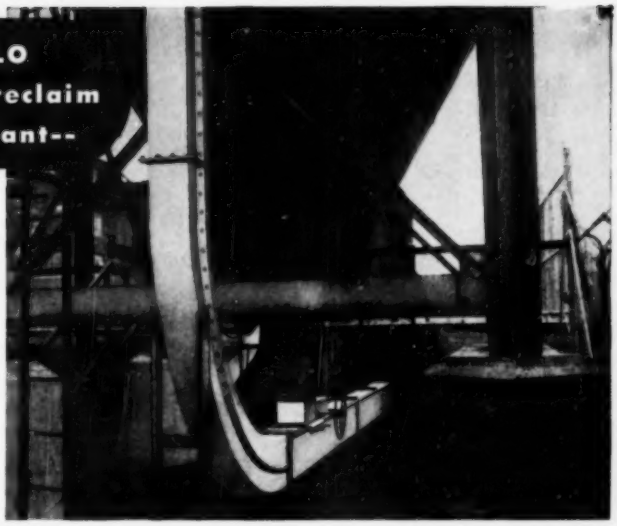
Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.
Sales Offices in Principal Cities. Distributors Everywhere.

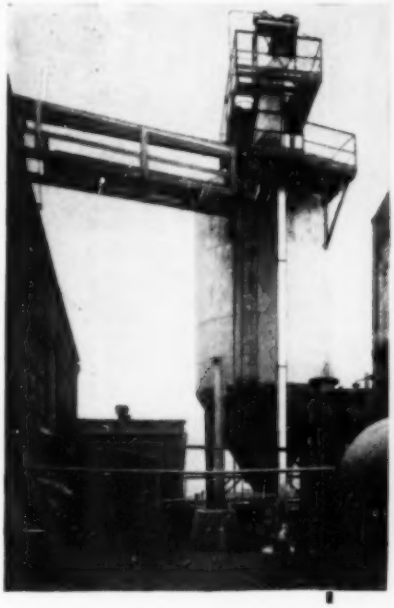
EXPANDING THE TUBE ENDS outside the header of one of the U-bend heat exchangers being turned out by the WESTERN BLOWER CO. Revere products have been used exclusively by this company for many years.

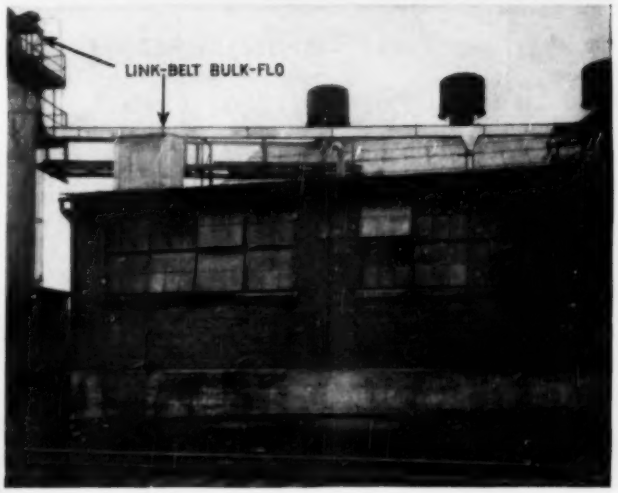
FLARING THE TUBE ENDS over the header. These coils, made of Revere Seamless Copper Tube, of Special Bending Temper, are used in tanks for domestic hot water, in side arm heaters, condensate coolers and converters.

How LINK-BELT BULK-FLO Conveyors unload and reclaim soda ash at chemical plant--

One Bulk-Flo, following L-path of 40 ft. horizontal by 50 ft. vertical, receives soda ash through canvas chute from bottom of R. R. car, carries it along horizontal run and then vertically into storage bin. This Bulk-Flo delivers either into a short horizontal screw conveyor feeding into center of bin, or to Bulk-Flo conveyor No. 2, which extends from top of bin and diagonally across roof of process building a distance of about 75 feet. It discharges the soda ash through building roof to either of two collecting hoppers.







The BULK-FLO Conveyor provides an economical means for handling free-flowing, granular, crushed, ground or pulverized materials. It is a feeder, conveyor and elevator all in one compact automatic unit. It minimizes breakage, degradation, dusting and contamination.

Book No. 2175, describing many applications of this flexible unit, will be sent upon request.

A Link-Belt Engineer will be pleased to discuss your problems without obligation.

How LINK-BELT BULK-FLO Conveyors can serve you . . .

11,600

LINK-BELT COMPANY

Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Houston 3, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices in Principal Cities.

LINK-BELT

CONVEYING MACHINERY

Simplify Your Engineering

Specify a Complete Air or Gas Compression Installation from One Company—Allis-Chalmers!

ONLY ALLIS-CHALMERS can furnish a compression installation as complete as this 18,000 cfm multi-stage unit which supplies large quantities of air for a low purity oxygen plant. It includes two four-stage centrifugal turbo-blowers, operated in tandem . . . steam turbine prime mover . . . surface condenser with steam jet air ejector . . . intercooler and aftercooler . . . auxiliary pumps, motors and control equipment.

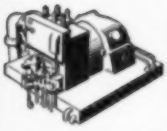
That means you'll get teamed, integrated equipment when you specify Allis-Chalmers. Preliminary engineering is greatly simplified, with a consequent saving in time and money. And responsibility for efficient performance rests solidly with only one manufacturer — a big advantage.

Allis-Chalmers offers you the advantages of almost 70 years experience in the design and application of blowers and compressors, as well as other high speed rotating machinery. Present engineering and manufacturing facilities are unsurpassed.

The Allis-Chalmers representative in your area can put you in touch with A-C's blower and compressor staff — specialists in kinetic pumping problems, who are excellently qualified to analyze your needs and work out equipment recommendations that are *right* for *your* job. Call your nearby A-C office today for this service.

ALLIS-CHALMERS, 1147A SO. 70 ST.
MILWAUKEE, WIS.

Steam Turbines



Allis-Chalmers steam turbines of the type shown in this installation are built to meet exacting standards of dependability, efficiency and accessibility. Built for any vacuum or exhaust pressure up to 400 lbs. Steam turbines of Allis-Chalmers design are available in all practical sizes . and are engineered to greatly reduce problems of operation and maintenance.

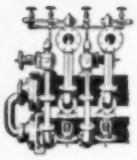
Surface Condensers

Every steam surface condenser built by Allis-Chalmers is tailor-made to specifications for the particular application. Through such flexibility of design the best size and shape of condenser is assured for each individual installation.

Condensers are designed to make every square foot of tube surface effective, to maintain lowest vacuum with minimum amount of heat rejection and expended energy.

A-C engineering and manufacturing facilities for fabricating condensers in sizes from 100 to 100,000 sq ft are unexcelled anywhere. Write for **Bulletin 19B6784** showing condensers being built.

Steam Jet Air Ejectors

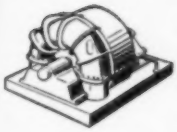


Allis-Chalmers surface condensers are furnished with steam jet air ejectors to remove air and other non-condensable vapors. Ejectors are precision-built units with no moving parts . . . and are designed to fit into small space. Usually ejectors are of the two-stage twin element type, but various other types and combinations are also available.

One of the Big 3 in Electric Power Equipment
Biggest of All in Range of Industrial Products

ALLIS-

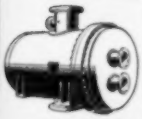
Multi-Stage Turbo-Blowers



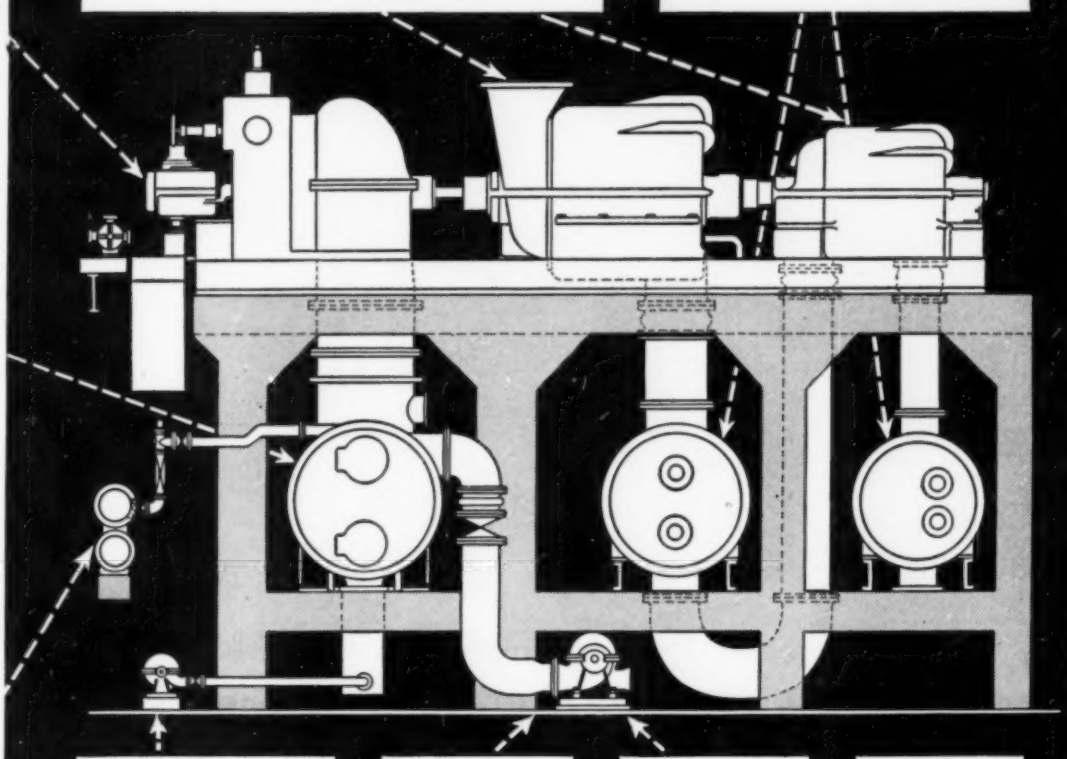
Used for air or gas boosting, circulating, exhausting, agitating, aeration. Built by Allis-Chalmers for volumes and pressures to meet essentially all requirements . . . with performance characteristics favorable for parallel and series operation.

Multi-stage blowers employ backward-bladed impellers—high efficiencies without close clearances. Cannot build up dangerous pressures. **Bulletin 16B6104.**

Inter and After Coolers



Surface type inter and after coolers are built by Allis-Chalmers in sizes to meet the requirements of the particular application. These units are of extremely heavy, rugged construction to withstand the severe operating conditions often encountered in this type of service.



Condensate Pumps

A-C builds complete line of single or multi-stage condensate pumps; horizontal or vertical. Extra large inlet volumes for low sealing head conditions.

Circulating Pumps

A complete line of circulating pumps are built by A-C in horizontal, vertical mixed flow or axial flow types.

Motors

Complete line assures proper motor characteristics for your condensate or circulating pump.

Motor Control

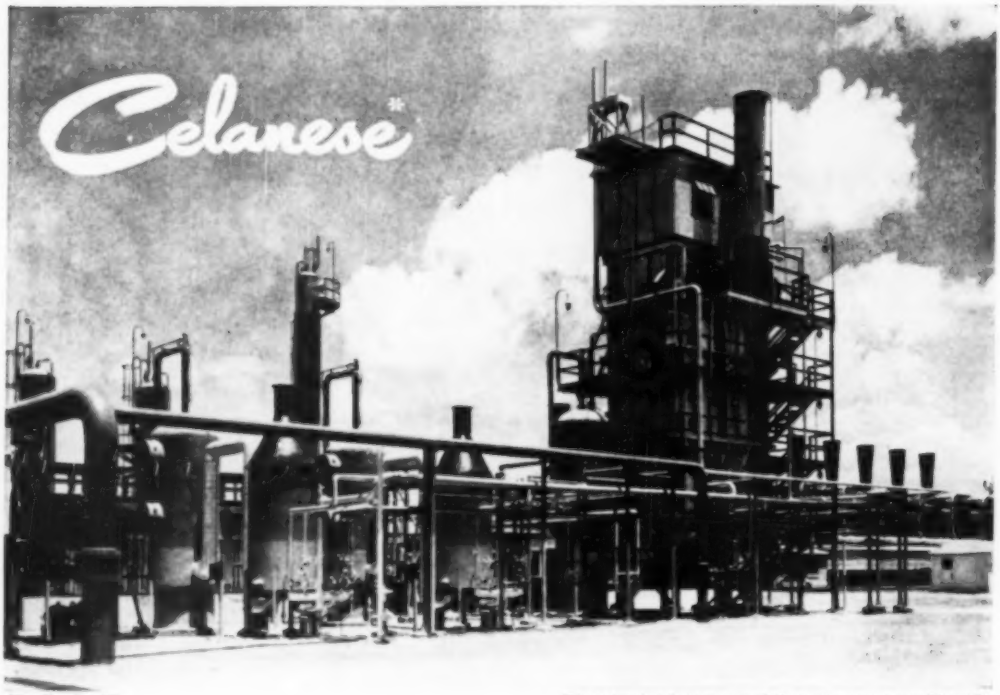
Proper control for all conditions of motor operation. Explosion-proof, water and dust-tight enclosures.

A-2886

CHALMERS

A-C ALLIS-CHALMERS

Works speak louder than words



*Reg. U. S. Pat. Off.

This modern installation is part of the operation which won this year's Award for Chemical Engineering Achievement. Congratulations, Celanese!

● Gas process plant built by Girdler

for Celanese Corporation of America

GAS PROCESSES DIVISION

THE GIRDLER CORPORATION

LOUISVILLE 1, KENTUCKY

Designers, Engineers, and Constructors

District Offices:
150 Broadway, New York City 7
2612 Russ Bldg., San Francisco 4
311 Tuloma Bldg., Tulsa 3

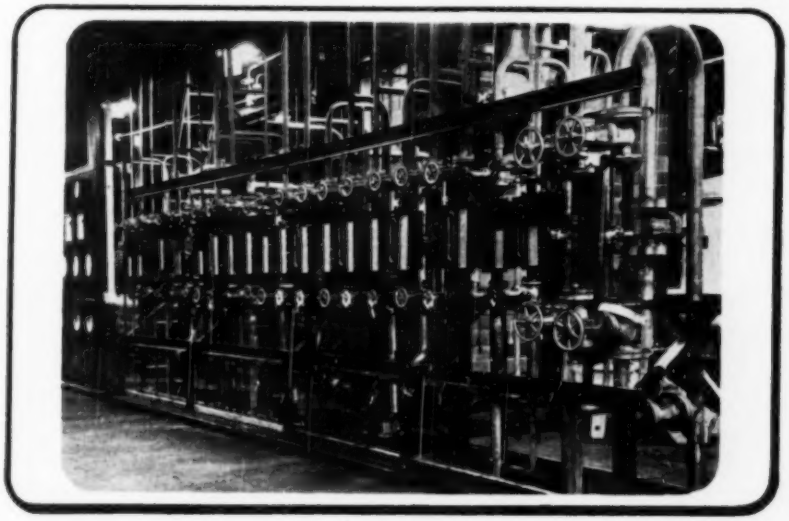
Celanese Corporation's leadership in synthetics originates with efficient, modern facilities and proven technical ability. So, when Celanese reports on equipment performance, it's worth repeating. Commenting on the Girdler-built hydrogen plant at Bishop, Texas, Celanese says: "The performance of this unit has been excellent."

Coming from Celanese, that commendation becomes a recommendation.

For good work well done, deal with Girdler on all facilities concerning the production, purification, or utilization of chemical process gases, liquid and gaseous hydrocarbons, and organic compounds.

ALOYCO STAINLESS STEEL VALVES

recover spent acetic acid for Hercules



The photograph of the panel-board above was taken in the Parlin, New Jersey, Plant of Hercules Powder Company. It is part of their equipment for production of cellulose acetate. Because shutdowns for valve replacement are costly, it would be downright extravagant to use any but the best corrosion-resistant valves here.

That is why E. B. Badger & Sons Company, engineers and constructors, installed Aloyco Stainless Steel Valves in the first place.

The utility of Aloyco Corrosion-Resistant Valves is more than skin-deep. These Valves are not merely stainless-trimmed, they are made of solid alloy throughout, except for handwheels and yoke bushings. And they are made of the *one* right alloy for the particular job on which each is used. Aloyco metallurgical experience makes that assurance doubly sure.

Just name your corrosive—there's an Aloyco Valve "made to order" for it.

Aloyco Flanged V-Port Globe Valve No. 423, 150 lb., ½" to 4" inclusive. This metering valve is available in Aloyco 20, 18-8SMo and other corrosion-resistant alloys.

GATE, GLOBE, Y, CHECK, TANK, SAMPLING AND V-PORT VALVES
SCREWED AND FLANGED FITTINGS

ALLOY STEEL PRODUCTS CO., Inc.

1301 W. ELIZABETH AVE., LINDEN, NEW JERSEY

SALES OFFICES: ATLANTA; CHICAGO; HOUSTON; LOS ANGELES; NEW YORK CITY; PITTSBURGH; WILMINGTON, DEL.

High Vapor-Pressure NAPHTHA

Superior features of pressure storage

- **Dependable operation**
  Routine checking and inspection assures dependable operation in all climatic conditions. No moving parts.
- **Positive Protection**
  No evaporation loss occurs as long as the pressure in the tank is below the relief valve setting.
- **Low Operating Cost**
  No operator, no machinery required.
- **Fire Safety**
  Air-vapor mixture in tank is too rich to ignite. Fire hazard reduced to a minimum.

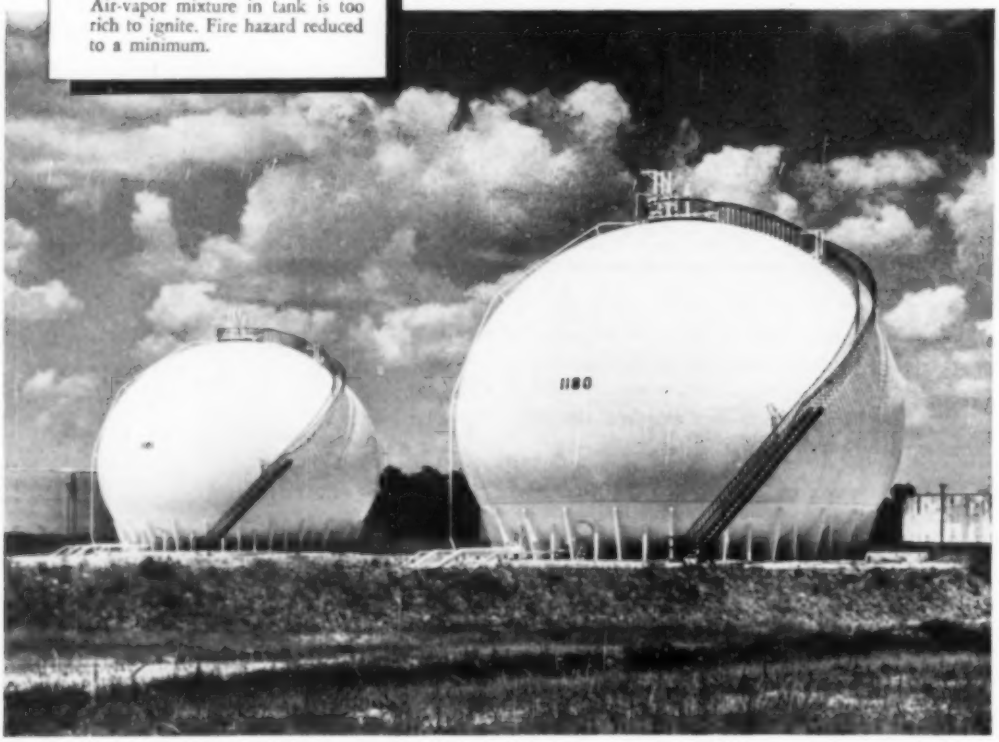
. . . *another* volatile chemical efficiently protected by pressure storage

Another product—naphtha—has joined the growing parade of chemicals whose vapors are being shackled by pressure storage. There's two big reasons why storage under pressure is fast becoming the accepted method for handling such volatile chemicals.

First, product losses are reduced or eliminated because pressure containers are designed to save that amount of a stored product which is normally lost through evaporation in a conventional storage tank. Second, the annual cost per bbl. of capacity is less than that for flat-bottom tanks.

For pressure storage, the chemical process industries are using either Hortonspheroids like those below or the familiar Hortonspheres. Write our nearest office for information on the type and size of pressure container for shackling your volatile chemicals.

Below: Two 30,000-bbl. Hortonspheroids used to store naphtha under 30 lbs. per sq. in. pressure at the Esso Standard Oil Company's petroleum refinery at Baton Rouge, Louisiana.

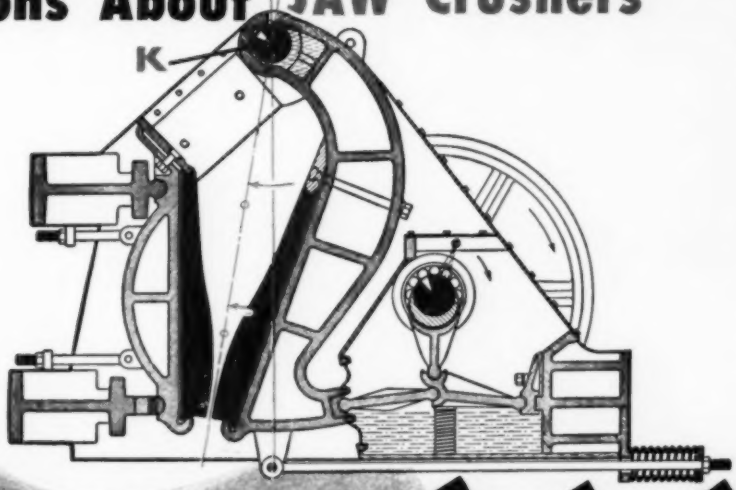


CHICAGO BRIDGE & IRON COMPANY

Atlanta 3	2120 Healey Bldg.	Detroit 26	1503 Lafayette Bldg.	Philadelphia 3	1625—1700 Walnut St. Bldg.
Birmingham 1	1510 North Fiftieth St.	Havana	402 Abreu Bldg.	Salt Lake City 1	1505 First Security Bank Bldg.
Boston 10	1005—201 Devonshire St.	Houston 2	2103 National Standard Bldg.	San Francisco 11	1222—22 Battery St. Bldg.
Chicago 4	2124 McCormick Bldg.	Los Angeles 14	1505 General Petroleum Bldg.	Seattle 1	1305 Henry Bldg.
Cleveland 15	2220 Guildhall Bldg.	New York 6	3318—165 Broadway Bldg.	Tulsa 3	1623 Hunt Bldg.

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PENNSYLVANIA

The *New* KUE-KEN *is* Changing Opinions About JAW Crushers



IT'S THE Patented ACTION

2 TO 5 TIMES GREATER CAPACITY

FIVE TO TEN TIMES LONGER JAW PLATE LIFE

MUCH LESS POWER REQUIRED PER TON CRUSHED

"CRUSHING WITHOUT RUBBING"

Blake or Double Toggle Crusher
(Designed 1858)

Note how swing jaw forces rock upward causing rock to rub against jaws (see arrows). This rubbing action rapidly wears jaw faces, increases the percentage of fines, and reduces capacity of the crusher.

Dalton Overhead Eccentric or Single Toggle Crusher
(Designed 1879)

Moving jaw forces rock both up and down (see arrows), causing a rubbing action that not only results in excessive fines, but causes heavy jaw plate wear and wasted power. Bearing pressures on this type are very high.

Until the new Kue-Ken came on the market, most operators (and engineers) held an understandably low opinion of jaw crusher efficiency. The old double toggle and overhead eccentric types (left) were heavy, slow speed, unbalanced, poorly lubricated machines that crushed with a rubbing motion between the jaws, resulting in rapid jaw plate deterioration, excessive fines, power waste, and low capacity.

Kue-Ken design has changed all this, because the Kue-Ken crushes by *pressure only*. With its hinge pin (K) located on the crushing zone center line, the Kue-Ken's massive swing jaw moves *squarely* against the rock (or other material), instantly gripping and crushing—without forcing rock upward; without rubbing. Result: greater capacity, longer jaw plate life, fewer fines, and less power demand.

A Texas plant reports that its Kue-Ken Jaw has crushed 225,000 cu. yds. of hard, wet river gravel during a 4 year period. No parts or replacement costs or out-of-service from breakdowns; only *minor service adjustments*. Don't turn down a Jaw for the job until you've investigated the Kue-Ken, the *improved* jaw crusher. Send for Bulletin 5012.

Exclusive Eastern Manufacturer and Distributor

PENNSYLVANIA CRUSHER COMPANY

DIVISION OF BATH IRON WORKS CORPORATION

Liberty Trust Building, Philadelphia 7, Pa.

New York • Boston • Pittsburgh • Birmingham • Roanoke • Detroit • Chicago • St. Louis •
Crosby, Minn. • Los Angeles — Associated with Fraser & Chalmers Engineering Works, London

Manufacturers of • Hammermills • Single Rolls • Bradmills • Kue-Ken Jaws • Kue-Ken Gyracones • Granulators • Impactors • Bradford Breakers

Good and Big

for Safety Directors,

AO Presents the completely NEW R5000 Line of

7
Respirators
1
Face Piece

NEW THREADED CHEMICAL CARTRIDGES

Use of wider cartridges results in decreased air velocity, lower resistance. Threaded cartridges screw directly into retainer assembly for gas-tight seal. No cover or inner ring required.

INCREASED VISUAL AREA — Results from use of a considerably thinner cartridge scientifically located in a lower position. Wearers can now *see* their work better and *do* it better!

NEW FACE PIECE — Provides comfortably snug fit and prevents leakage.

Safety Products Division

NEWS

Foremen, Workers —

AO
Twin Cartridge
DUST AND CHEMICAL
RESPIRATOR

TWIN CARTRIDGE RESPIRATORS

The 5000 line with INTERCHANGEABLE Cartridges or Disc Filter offers the maximum in Protection, Convenience and Comfort against Dusts, Gases and Vapors. With a single face piece, the equipment is quickly, easily converted to any of five types of respirators.

NEW FILTER RETAINER ASSEMBLY

Accommodates either revolutionary flat disc AO chemically treated felt types, dust cartridges or chemical cartridges.

NEW FLEXIBLE METAL FITTING BRACE

Located between inlet ports . . . slightest hand pressure on brace shapes face piece to wearer's features. Stays put, once adjusted. Headband is indirectly joined to brace — pressure pull cannot distort pliable rubber face piece.

OTHER FEATURES— New Port and Valve design for easy inhaling and exhaling, superior drainage and prevention of snagging on clothes or face . . . Double Length Rubber Headband for "storing" respirator around neck . . . Auxiliary Filters available to lengthen cartridge filter life against dusts and paint mists . . . Sanitary, Washable Facelet.

Your AO Safety Products Representative Can Supply You with the Respirator and Cartridges that Best Meet Your Needs to Combat the Following Hazards:

- Combination of all dusts—toxic, nuisance and pneumoconiosis-producing. Either flat "throw-away" disc type or reusable cartridge type filter. (Bureau of Mines Approval)
- Nuisance and pneumoconiosis-producing dusts in mining, quarrying, tunneling. (Bureau of Mines Approval)
- Toxic dusts caused by grinding and crushing lead, cadmium, arsenic, chromium, manganese, selenium, vanadium. (Bureau of Mines Approval)
- Low concentrations of light organic fumes, vapors and gases. (Approved by Bureau of Mines)
- Low concentrations of acid gases, fumes and mists.
- Low concentrations of *combined* acid and organic gases.
- Nuisance concentrations of ammonia.
- Combination of all dusts and organic vapors.
- Metal fumes such as may arise in welding, smelting or similar operations.

American Optical COMPANY

Southbridge, Massachusetts
Branches in Principal Cities

COPPER ALLOY BULLETIN

CONDENSER AND HEAT EXCHANGER TUBING EDITION

REPORTING NEWS AND TECHNICAL DEVELOPMENTS OF COPPER AND COPPER-BASE ALLOYS

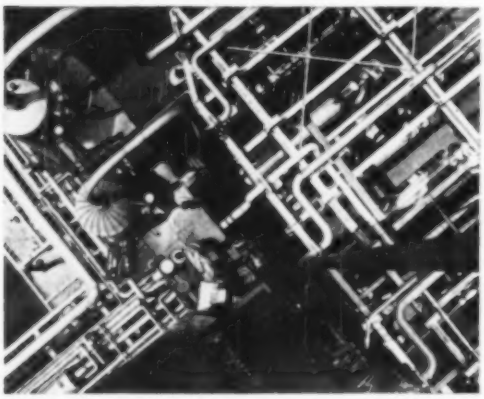
Prepared Each Month by BRIDGEPORT BRASS COMPANY "Bridgeport" *Headquarters for BRASS, BRONZE and COPPER*

CONDENSER AND COOLER TUBE PROBLEMS

at Bayonne Tide Water Associated Oil Company Refinery

With processing operations maintained on a continuous basis for long periods, the problem of failure due to tube corrosion is a serious one. The shutdown of a single condenser or cooler may mean the closing down of the entire operation involving the loss of thousands of barrels of production. Every effort is made to keep going. Leaky tubes are plugged up and the equipment is kept in service as long as possible. Careful records are kept on some 800 condensers and heat exchangers to indicate when retubing is advisable.

Cooling Water Corrosive. Tide Water Associated Oil Company's biggest corrosion problem is to combat the corrosive action of



View of heat exchangers in T. C. C. unit at the Bayonne, N. J. Tide Water Associated Oil Company refinery.

the cooling water. Their Bayonne, New Jersey plant uses New York Harbor water for most of their cooling operations. It is drawn from the Kill van Kull between Staten Island and New Jersey near the New York Bay. A city sewer empties into the channel about 500 feet above the intake. In addition, sea shells, leaves, grass and other debris as well as silt and mud churned up by the propellers of passing ships, all contribute to contaminate the water. Revolving screens and secondary strainers are relied upon to prevent debris from entering the equipment. At present the refinery draws approximately 50,000 gallons of water per minute. Additional pumps now being installed will bring this up to about 100,000 gpm.

Cooling water varies from 34°F in winter to 83°F in summer. Condensers and coolers are designed for a 77°F inlet water temperature and 110°F maximum water outlet.

The history and performance of condenser tubing used in a gasoline reflux condenser is typical.

Condenser contains 830 tubes, ¾" diameter, 16 BWG, 16 feet long.

Date	*History of Tubes*
July 1941	Admiralty placed in service.
June 1943	13 plugged.
March 1944	23 plugged
November 1944	15 plugged
June 1945	52 plugged
April 1946	Completely retubed with Admiralty.
August 1948	9 plugged
June 1949	Completely retubed with 70-30 Cupro Nickel.

Cupro Nickel Now Standard. For a number of years Admiralty tubes were standard, but about three years ago 70-30 Cupro Nickel replaced it because of its exceptionally fine performance in a unit such as this.

Hot fuel oil is drawn from the topping tower, passes through two stacked fuel oil cooler units entering the upper unit at approximately 435°F and leaving the lower unit at about 100°F. Cooling water enters the lower unit about 77°F and leaves upper unit at approximately 110°F. Both units contain 318 tubes, ¾" OD, 14 BWG, 16 feet long. Tubed with 70-30 Cupro Nickel in July 1941, the upper unit was retubed in May 1947 – a service period of 6 years – because of tube sheet and tube end corrosion. Up to that time no repairs of any kind were required. The lower unit is still in operation (8 years), with no repairs needed.

Duplex Offers Solution. Exceptionally corrosive conditions which are not solved satisfactorily with single-walled tubing such as D.E.A. (diethanolamine cooler) are being studied as possibilities for Duplex Tubing – steel or aluminum to the D. E. A. side and Admiralty or Cupro Nickel to the cooling water side.

No one alloy will serve every condition. Careful records of tube alloy performances are invaluable. Bridgeport Laboratory will be glad to work with operators to select the alloy best suited for specific operating conditions.

BRIDGEPORT BRASS

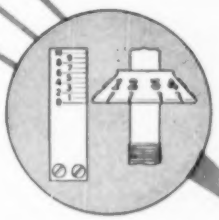
BRIDGEPORT BRASS COMPANY, BRIDGEPORT 2, CONN. • *ESTABLISHED 1865*

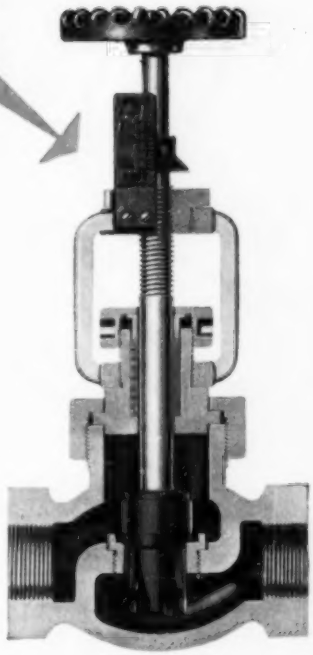
Mills at Bridgeport, Connecticut, and Indianapolis, Indiana • In Canada: Noranda Copper and Brass Limited, Montreal

A Hand Control Valve

with Micrometer Indication

. . . the BELFIELD HI-LIFT





THE Belfield Hi-Lift Hand Control Valve is ideal for use where automatic regulation is not necessary or advisable. It was designed to provide micrometer adjustment of flow . . . features an indicating scale (see inset illustration) to show percentage of stem travel to 1% and an inner valve capable of responding to such close correction.

The Belfield Hi-Lift is available with v-port* or parabolic discs. Sizes range from $\frac{1}{4}$" to 8". Straight through or angle models . . . for pressures up to 600 lbs. Body of Bronze, High-Tensile Iron or Cast Steel. . . and with Bronze or Stainless Steel Trim.

Every Belfield Valve is backed by the entire Minneapolis-Honeywell network of branch offices and factory-trained field engineers, as near to you as your phone.

Call in your local Honeywell engineer for detailed information . . . or write for a copy of Bulletin #242-1.

BELFIELD
WORLD'S LARGEST ORGANIZATION FOR ADVANCED INSTRUMENTATION AND CONTROL
MH MH
VALVES

MINNEAPOLIS-HONEYWELL REGULATOR CO.
BELFIELD VALVE DIVISION
Philadelphia 44, Pa.
Offices in 73 principal cities of the United States, Canada and throughout the world

**See illustration*

MINNEAPOLIS Honeywell — *Diaphragm Valves* AND PROCESS CONTROL SPECIALTIES — Belfield VALVES

When ordering condenser tube

DO YOU SPECIFY SIZE AND ALLOY ONLY ?

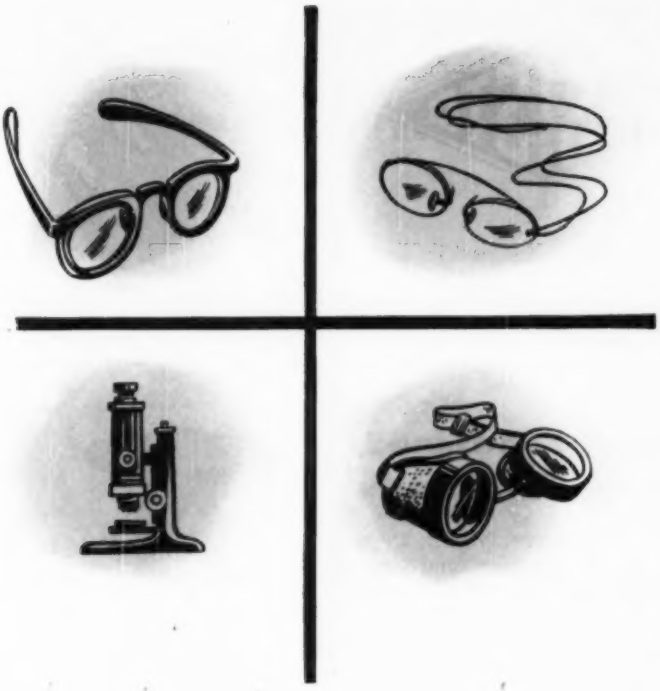
Tube is more than size and alloy. Such information must appear on your order, of course, to satisfy a mechanical requirement.

But really, the main part of any specifications lies in the name of the manufacturer you choose to supply the tube. *That* must be your first consideration, for upon *that* depends the service you can expect from the tube after it is installed.

It is to your advantage, therefore, to specify *Wolverine* on your orders for condenser tube. This name stands for quality-control and assures you of dependability far beyond what you would normally expect.

There IS a difference in tubing, you know

WOLVERINE TUBE DIVISION
CALUMET AND HECLA CONSOLIDATED COPPER COMPANY
INCORPORATED
MANUFACTURERS OF SEAMLESS NON-FERROUS TUBING
1427 CENTRAL AVENUE • DETROIT 9, MICHIGAN



A TEAM OF EYES
FOR BETTER STEEL CASTINGS

Knowing eyes, trained by long experience contribute to each step in the careful process of making Sivyer steel castings. The executive, the metallurgist, the foundryman, the grinder, even the salesman . . . all project and combine the resources of their individual skills and knowledge into a smoothly working team. Their goal . . . the production of the finest in high alloy castings.

SIVYER

SPECIALISTS IN HIGH ALLOY AND SPECIFICATION STEEL CASTINGS

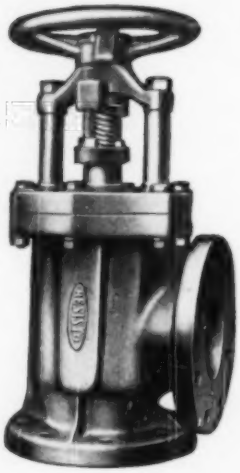
SIVYER STEEL CASTING COMPANY • MILWAUKEE CHICAGO

FOR YEARS THE HALLMARK OF ACID RESISTING EQUIPMENT

RESISTO

FREE FLOW
"Y" Type

ANGLE Type



Hard Lead, Lead Lined, Iron, or Steel Body

RESISTO ACID RESISTING VALVES are recognized by the Chemical and Process Industries as embodying original, advantageous features, and assuring superior performance to successfully meet the severe conditions imposed by searching and corrosive liquids.

RESISTO VALVES are made with solid chemical hard lead alloy bodies, or with bodies lined with lead; correctly designed and perfectly machined . . . simple, durable, and strong . . . will not clog or leak . . . maximum service guaranteed.

RESISTO EQUIPMENT allows hungry acids to perform only the duties for which they were originally designed.

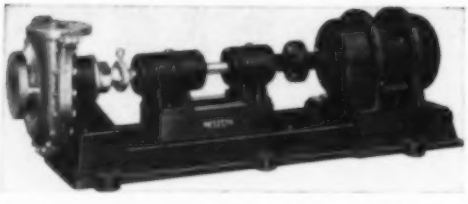
WEDGE GATE Type

DIAPHRAGM VALVE
Globe Type

Split Type CHECK VALVE

CHECK VALVE

RESISTO ACID PUMPS



Resisto Acid Pumps are designed for resistance, durability and efficiency. Perfectly aligned and balanced . . . the product of skilled craftsmen, Resisto Pumps are made in a variety of metals to meet specific conditions. . . . Stainless Steel, Hard Lead, Rubber Lined, Nickel, Monel, etc.

RESISTO

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CUSTOM-BUILT EQUIPMENT

For the Chemical and Food Processing Industries

KELLEY

STAINLESS STEEL Fabrication

ONE UNIT OR CARLOADS

ACID PLANTS
★
CHEMICAL PLANTS
★
PAPER AND PULP MILLS
★
RAYON PLANTS
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TEXTILE PLANTS
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PETROLEUM REFINERIES
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BLEACH AND DYE HOUSES
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BEVERAGE DISPENSERS
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BREWERIES
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DAIRY PLANTS
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FOOD PLANTS
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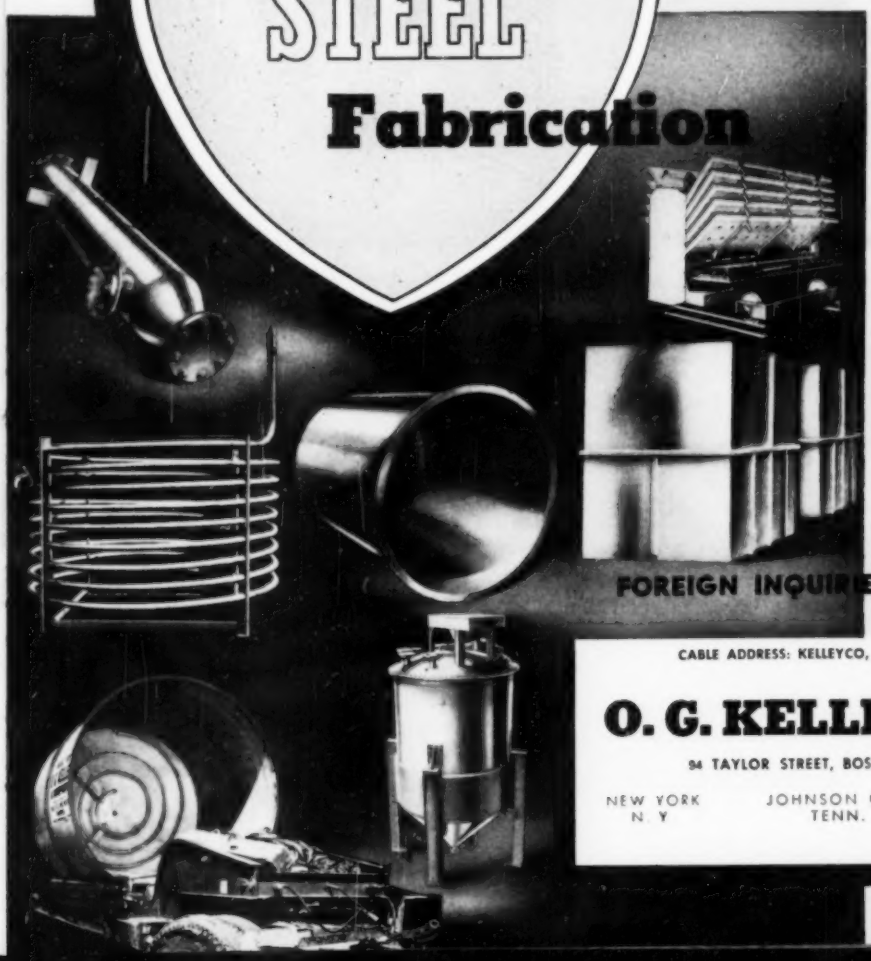
MEAT PACKING PLANTS



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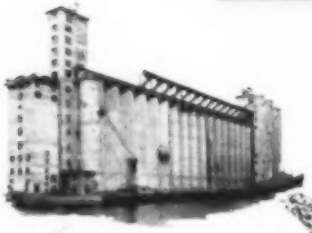
O. G. KELLEY & CO.

94 TAYLOR STREET, BOSTON 22, MASS.

NEW YORK N. Y | JOHNSON CITY TENN. | ELIZABETH N. J.

Your plant can CLEAN-UP with a KIRK & BLUM DUST COLLECTING SYSTEM

The large illustration shows a relay fan which handles grain in a milling plant. Switch valves enable the same fan to handle material from two lines, discharge to two additional lines. Dust collectors in background are part of another Kirk & Blum system.



The photo directly above shows an elevator where grain is unloaded, stored, cleaned and reloaded with the help of numerous Kirk & Blum systems.

Kirk & Blum Dust Collection and Fume Control Systems are widely used in chemical, food, drug and allied fields. Here too, the "invisible" tool CLEAN AIR, has proved invaluable in efficient manufacturing and processing.

For example, two views in grain handling and milling are shown. In this industry, adequate dust collection is a *must*, since the dust presents both health and safety hazards besides contributing to general inefficiency.

Significant then, that many of the leading plants in this industry have selected and re-ordered Kirk & Blum systems. If *you* have a dust or fume problem, call on Kirk & Blum for efficient analysis and prompt, no-obligation recommendations. The Kirk & Blum Mfg. Co., 2908 Spring Grove Ave., Cincinnati 25, Ohio.

FOR CLEAN AIR . . . THE [redacted] TOOL

KIRK AND BLUM

DUST AND FUME CONTROL SYSTEMS

Here's qualified help to get the best LIFE/COST ratio for your tubes!

TO be sure of getting the best life/cost ratio from your tubes, you need more than just any steel that answers your particular problems of heat, pressure, corrosion or oxidation. You want the *one specific steel* that gives you all this at the lowest possible cost in terms of service per dollar invested!

That's why it will pay you to call in qualified assistance to help you make your selections.

Metallurgists of The Timken Roller Bearing Company are recognized authorities on high temperature tubing applications. They are backed by 19 years of experience and research. From a wide selection of Timken® fine alloy steels they will select the correct tubing to give you the most efficient and economical performance for your specific job.

And when the correct analysis has been selected, you can be sure of this: Because of rigid quality control by Timken at every step in production, you'll get the same uniform characteristics and the same high quality in every shipment you order.

The Timken Technical Staff will be glad to study your high temperature tube problems at any time, without obligation. Write for your copy of our booklet, "Facilities and Products". The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

TIMKEN 18-8 STEEL TUBES Shows the best combination of creep strength, oil corrosion and oxidation resistance up to 1500°F.

TIMKEN SICROMO 9M STEEL TUBES This steel possesses the maximum corrosion resistance of any of the steels below the stainless group.

TIMKEN SICROMO 7 STEEL TUBES For applications requiring better corrosion resistance than can be obtained with 5% Chromium type steels.

TIMKEN SICROMO 5 S STEEL TUBES For oxidation resistance to 1500°F. Good creep strength and corrosion resistance to 1300°F.

TIMKEN 4-6% CR MO STEEL TUBES For service up to 1200°F. Superior corrosion resistance. Less oxidation resistance than Sicromo 3.

TIMKEN SICROMO 3 STEEL TUBES For service up to 1200°F. Have excellent oxidation resistance and good corrosion resistance.

TIMKEN 2¼% CR-1.0% MO STEEL TUBES For service up to 1150°F. Has greater resistance to creep than 2% Cr. ½% Mo. Steel.

TIMKEN SICROMO 2 STEEL TUBES For service up to 1200°F., where better scale resistance is required than can be obtained with 2% Cr. ½% Mo. Steel.

TIMKEN 2% CR-½% MO STEEL TUBES For service up to 1150°F. Intermediate corrosion resistance plus good creep strength, fair oxidation resistance.

TIMKEN DM STEEL TUBES For service up to 1150°F. This steel offers outstanding creep strength.

TIMKEN CARBON-MO STEEL TUBES For temperature up to 1000°F. Improved creep strength makes it safer than carbon steel.

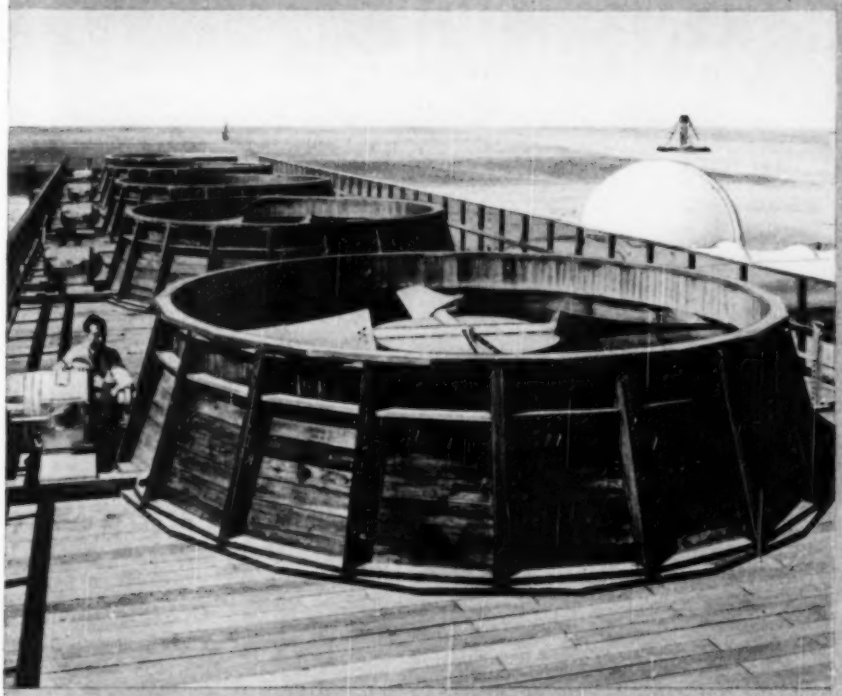
TIMKEN CARBON STEEL TUBES Generally for service not exceeding 900°F., where corrosion and oxidation resistance are not important.

50th birthday of the company whose products you know by the trade-mark: TIMKEN

Specialists in alloy steel—including hot rolled and cold finished alloy steel bars—a complete range of stainless, graphitic and standard tool analyses—and alloy and stainless seamless steel tubing.

FOSTER WHEELER COOLING TOWERS

on many landscapes—in many climates



The cooling tower shown here serves the high speed engines operating the 6 by 6 foot supersonic wind tunnel of the NACA's Ames Aeronautical Laboratory at Moffet Field, California. It is an induced draft type of tower which was designed by Foster Wheeler engineers for high efficiency in cooling. The flexibility of this design, now standardized, enables Foster Wheeler to engineer and erect cooling towers for the requirements of any load anywhere in the world.

FOSTER WHEELER CORPORATION
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Here are essential facts on

SUPER-CENTRIFUGE { design / operation / application

THIS NEW BULLETIN provides a basic understanding of Sharples Super-Centrifuges and their applications in Industry.

Developing the highest centrifugal force commercially available—ranging upwards of 13,200 times the force of gravity—the Sharples Super-Centrifuge will raise the standards of performance . . . and perform previously impossible separations in your processing. With the application of this enormous force, immiscible liquids having extremely small differences in specific gravity can be separated . . . and solids as small as 2 microns in diameter can be removed.

The Super-Centrifuge is an important part of the Sharples *complete line of centrifuges* which are increasing the scope and lowering the costs of industrial processing today.

The informative data in this new bulletin should prove profitable to you. Write today for your copy.

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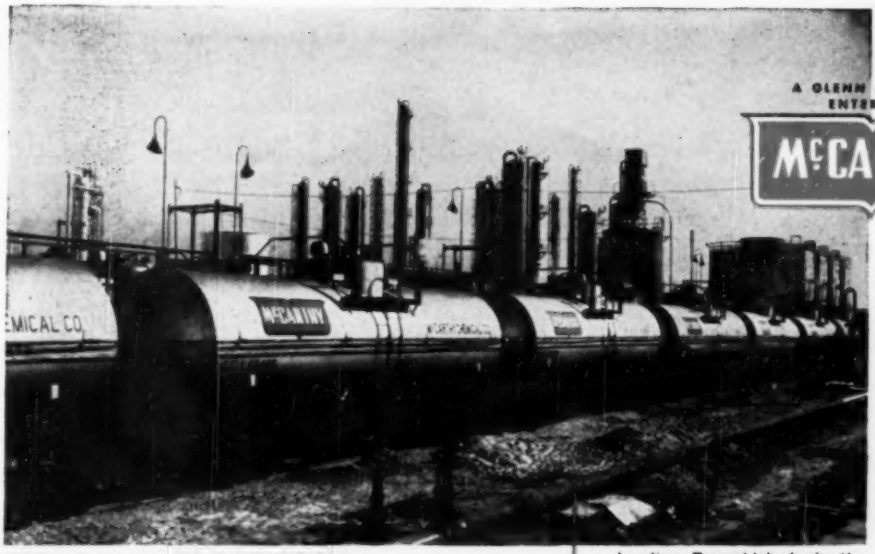


A GLENN McCARTHY ENTERPRISE

McCARTHY

Loading Formaldehyde in the 10,000 gallon tank cars operated by McCarthy. Each car is especially lined and insulated.

Time to Talk '50 with McCarthy

Chemical process industries are planning ahead, checking 1950 contract needs, looking to the McCarthy Chemical Company to meet those requirements from the predictable volumes of primary and intermediate chemicals flowing today from the new McCarthy unit at Winnie, Texas.

Assured supplies of petro-chemicals are made possible by the unique McCarthy "flow-chart" — a production cycle that begins and ends with McCarthy-owned and operated facilities and resources that provide unlimited reserves of natural gas, a supervised gathering system and the fully controlled processing of hydrocarbons.

From well to market, this steady and uninterrupted flow of raw materials for plastics, dyes, explosives, paints and other chemical applications is helping meet today's demands efficiently, economically, promptly.

Now it's time to talk '50 with McCarthy. Look to McCarthy Chemical Company for your 1950 contract requirements—consult McCarthy about your needs. Write, wire or call today.

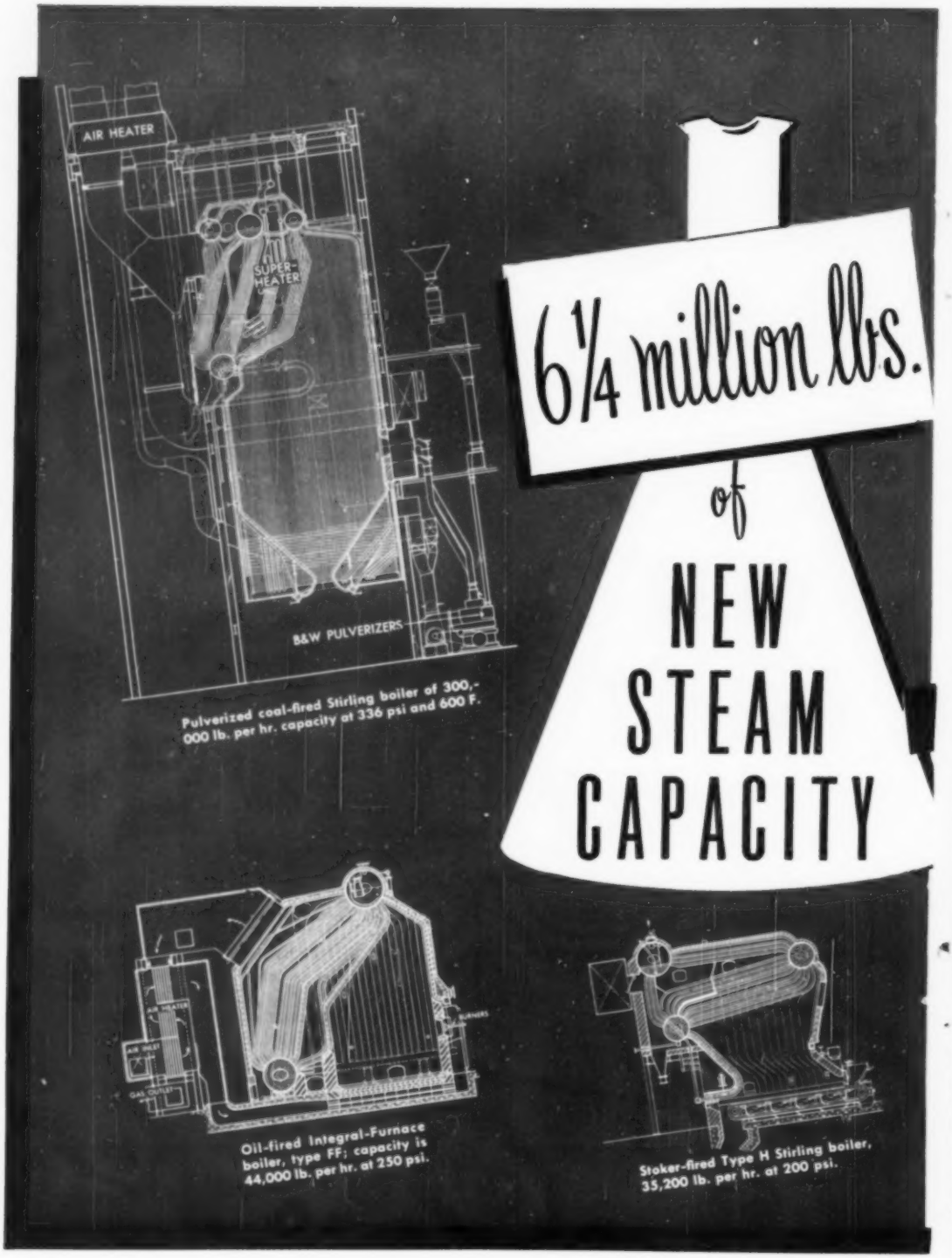
- **37% Inhibited Formaldehyde**
- **37% Uninhibited Formaldehyde**
- **Methanol**
- **Propane**
- **Acetaldehyde**
- **Fuel Oils**
- **Butane**
- **Gasoline**
- **Kerosene**

New Horizons in Hydrocarbons

McCarthy producing companies are planning ahead with industry, exploring New Horizons in Hydrocarbons through more economical, more efficient processes, conserving more and more of our valuable natural resources by converting yesterday's wastes into today's valuable raw materials.

McCARTHY CHEMICAL COMPANY

SHELL BUILDING — HOUSTON, TEXAS TELETYPE NO. 181 PHONE: PRESTON 7204


AIR HEATER
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B&W PULVERIZERS
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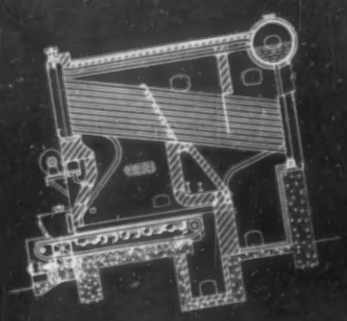
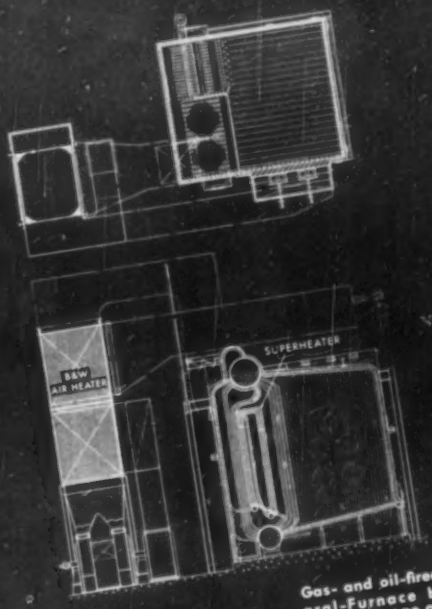
6¼ million lbs.
of
NEW STEAM CAPACITY
Oil-fired Integral-Furnace boiler, type FF; capacity is 44,000 lb. per hr. at 250 psi.
Stoker-fired Type H Stirling boiler, 35,200 lb. per hr. at 200 psi.



Stoker-fired Design 32 boiler, 15,000 lb. per hr. at 200 psi.



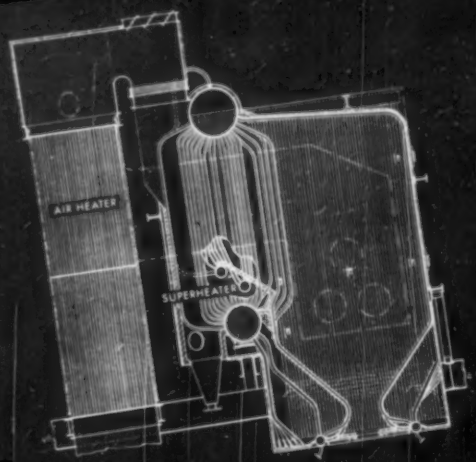
Gas- and oil-fired Integral-Furnace boiler, Type FH; 150,000 lb. per hr. at 600 psi, 750 F.

... FOR PROCESS INDUSTRIES

The record shows 6¼ million lb. of new B&W steam capacity ordered by processing plants in the past 12 months — a substantial majority of all new capacity purchased by the industry during that period. This record typifies a long-standing preference among users of process steam for units designed and built by B&W specifically for their processing, heating, and power-generating requirements.

There are definite reasons for this impressive acceptance: B&W units provide a wide choice of operating conditions as to space, capacity, pressure, temperature, fuel, and firing method; B&W's 80-year experience in fitting boilers to specific jobs in all industries is a valuable intangible that expresses itself in the extra margin of dependability and economy built into every B&W unit.

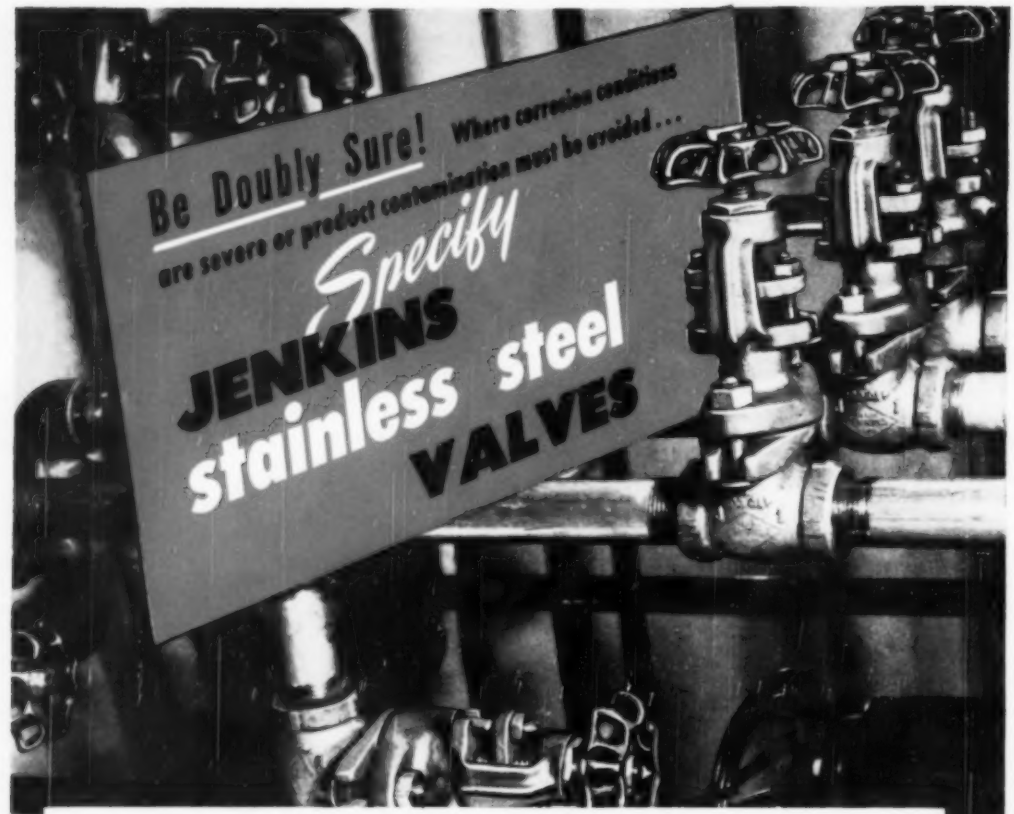
Consult B&W in the early stages of your next planning for steam-plant modernization or new construction. Your steam-supply problems, regardless of size or service, will receive the same unbiased and constructive attention.



Oil-fired Integral-Furnace boiler, Type FH with provision for future pulverized coal firing; capacity 85,000 lb. per hr., 200 psi and 580 F.

BABCOCK & WILCOX

G-432



In plants handling corrosive liquids, or fluids that must be kept free from contamination or discoloration, Stainless Steel Valves must be not only the right *type*, but fabricated of the *proper* alloy for the service.

To keep production at peak, and down-time for repairs and replacements to a minimum, alert management chooses Jenkins Stainless Steel Valves. Built to the same quality standard which has made "Jenkins" the preferred industrial valve, Jenkins Stainless Steel Valves are available in a range of sizes to meet almost any service requirement.

Equally important, however, is Jenkins Engineering Service. Providing information you need to select the alloy or type of valve which will render the best service (based on analysis of specific information about the valve installation), Jenkins engineers can be of valuable assistance.

Send the coupon today for the new folder describing the complete line of Jenkins Stainless Steel Valves. It includes specifications and helpful data on selection.

Jenkins Bros., 80 White St., New York 13; Bridgeport, Conn.; Atlanta; Boston; Philadelphia; Chicago; San Francisco. Jenkins Bros., Ltd., Montreal.

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U.S.I. CHEMICAL NEWS

November ★ A Monthly Series for Chemists and Executives of the Solvents and Chemical Consuming Industries ★ 1949

New U.S.I. Chemical, Diphenyl Carbonate, Available for Research

An announcement has recently been made by U.S.I. that diphenyl carbonate is now available in research quantities. The chemical is a white granular solid at room temperatures and when crystallized from alcohol or acetone it occurs as needle-shaped crystals. It has a phenolic odor.

Diphenyl carbonate is soluble in hot alcohol, ether, benzene, carbon tetrachloride, acetone, glacial acetic acid, and other organic solvents. It is insoluble in water. It is hydrolyzed by hot alkalis and readily undergoes hydrolysis and ammonolysis. It has a density of 1.0997 as a liquid (111°C) and 1.272 as a solid (14°C).

It is available in 99+% purity.

Carbon Black Being Tried Out As a Soil "Heater"

Addition of carbon black to soil as a means of increasing soil temperatures and thereby extending the growing season is the subject of research at several agricultural schools throughout the country, according to a recent report. The report goes on to say that the initial tests indicated that carbon black, mixed into soil to a depth of two inches raises the average soil temperature at the surface and two inches down. This is because the carbon black, in the concentrations used, darkens the soil, increasing heat absorption. In the tests, the chemical was applied at the rate of 4000 pounds to the acre, though it was stated that application at half this rate has been found effective.

There is no evidence, according to the report, to indicate that carbon black is a plant nutrient, is digested by plant roots, or has any other direct effect on plants. Whatever influence it exerts on plant growth is attributed to its effects on soil temperatures, as well as on the texture, salt-retention, and moisture-retention of soils.

Stable Graphite Film Has Novel Lubrication Uses

A successful means of applying a stable graphite film to practically any surface is said to have been developed recently. The film, as applied by the new process, is extremely thin (0.00015 to 0.0005 inch) but is claimed to have excellent resistance to abrasion and exceptional bearing strength. The adhesion to the intended surface is high and, it is pointed out, on metal and most other surfaces sufficient diffusion of the graphite into the surface is obtained to ensure presence of a graphite surface even when the external coating is apparently removed. Application is described as being by spray or dip, following normal surface preparation, and is followed by baking at temperatures of 300° to 400° for a curing cycle of one hour maximum which achieves diffusion of the graphite into the base material. The new process is said to have been used successfully on metal, plastics, rubber, and ceramics.

Pyrenone-Treated Packages Seen Saving Millions in Food Damages

Insect-Resistant Multi-Wall Paper Bags Made By St. Regis Paper Co. Prove 100% Effective in Safeguarding Flour During Storage And Shipment—Other Developments Foreseen

Insect-resistant paper bags which give flour in transit and in storage complete protection from insect infestation have just been announced by the St. Regis Paper Company. Newest, and one of the most important industrial uses yet found for U.S.I.'s non-toxic insecticide material, Pyrenone*, this development presages a whole new approach to the problem of preventing insect damage to packaged food products. The government estimates that such damage now costs the American public millions of dollars annually.

Completely automatic filling of multi-wall flour bags in a modern plant. Outstanding insect resistance is achieved when the outer wall of this type of bag is treated with U.S.I. Pyrenones.

U.S.I. reports that the St. Regis Paper Co., after three years of investigation devoted to technical problems and rigid testing, has made available multi-walled bags, with the outer surface of the outside wall treated with Pyrenone. These bags have been demon-

MORE

Color Photographs From Black and White Negatives

A new method of making high-quality color prints from black and white negatives has recently been demonstrated. It involves making a special black and white print and then staining this print with dyes.

The crux of this process is in the color-selective nature of the black and white print. This is obtained by making the print as a gelatin relief image of the original exposure. The thickness of the gelatin then determines how much color is absorbed.

It works this way: The original picture is taken much as any color photograph, observing the same range of lighting contrasts. The negative is then exposed by contact or projection onto a special stripping film, which when processed by baths forms the gelatin relief image. In the final steps, the silver is bleached out of this film and is replaced with a black dye.

When a color is applied it acts on the black dye as a cutting reducer, replacing it in proportion to the thickness of the gelatin. All the various tones and shades of any particular color area are obtained with a single sweep of the brush. Colors are automatically modified with black and white to simulate light and shade, while highlights and white area accept no color and remain clear. Color corrections can be made by simply applying the correct color over the undesired color.

Separates Fatty Acids By New Process

A new method that makes it possible to segregate almost completely the high-melting and low-melting fatty acids of a fat into separate ester fractions has been described recently. Directed interesterification, in which ester-ester interchange is carried out in triglyceride mixtures with simultaneous crystallization of solid glycerides, was applied to glyceride mixtures containing free hydroxyl groups. Solid saturated diglycerides and saturated monoglycerides were precipitated from cottonseed oil.

Helpful Information For Adhesive Users

A new pamphlet entitled "How to Prepare and Use Glues, Pastes, and Gums" has recently been made available for distribution. It contains data on storage and handling of all types of adhesives.

Urethan Effective In Multiple Myeloma

Four patients suffering from multiple myeloma underwent urethan therapy which resulted in striking improvements in all aspects of this condition, it has been reported. A total of 120 to 290 grams of urethan was administered orally in governed doses over an 8 to 10 week period and the patients were observed over a 7 to 13 month period following. Physiological symptoms subsided (and the blood picture improved greatly) after 2 to 4 weeks of this treatment. There was no evidence of skeletal recalcification 4 to 6 months after treatment, however. It was stated that although urethan treatment looks promising at this time, further work is needed to determine the extent of repair of the bone tissue and long term results of this type of therapy.

CONTINUED

Treated Packages

strated to be practically impervious to insect penetration even under exceptionally severe conditions. Availability of flour packed in insect-proof bags already has been announced by one of the large milling companies.

St. Regis representatives advised that while untreated kraft multi-wall bags are fully satisfactory for flour shipments under normally favorable conditions, the treated bags were developed to meet extreme conditions where weather or other circumstances favor rapid breeding and heavy infestations.

Severe Field Tests

Full protection under unusually abnormal circumstances was demonstrated first by severe tests conducted under the supervision of the American Institute of Baking and the Institute of Paper Chemistry, and later confirmed by trial commercial shipments of flour.

In a recent and dramatically severe test, a new freight car loaded with 900 bags of flour, packed in Pyrenone-treated bags, was deliberately infested with 4,000 red rust beetles, one of the more destructive of the insects attacking grain and flour. The car was then sealed and shipped from a flour mill in Enid, Okla., to a bakery chain in Memphis.

At the termination of the trip after 70 hours in transit, investigators found that every bag had survived the journey intact and ,unpenetrated. They found 2,361 of the beetles dead and the remainder either paralyzed or moribund. This result was regarded as having given the flour 100 per cent protection.

A second test commercial shipment of flour in multi-wall paper bags treated with Pyrenone was even more stringent, but equally successful. In this case, 3,000 live confused flour beetles were scattered over 900 multi-wall flour bags, and fifteen days elapsed before the car was opened and inspected. The count showed 2,622 dead beetles, 41 in a coma and 3 paralyzed. In addition, 28 dead larvae were found. No insects of any kind penetrated the treated outer wall of the bag.

Food losses due to insect penetration of packed flour, cereals and other products present a major economic problem, and insect-resistant packages of all types long have been a goal of manufacturers. Pyrenone materials, which combine freedom from toxicological hazards with effectiveness against most if not all insect invaders, have permitted progress not heretofore possible in reaching that objective.

The St. Regis company has other developments underway leading toward the protection of other food products with Pyrenone-treated papers. Pyrenones are especially effective against most types of grain insects, including the hard-to-kill cadelle. Their effectiveness stems from the synergistic combination of a new chemical, piperonyl butoxide, with pyrethrins. Exhaustive tests have demonstrated the fact that Pyrenones are non-toxic to humans and animals.

Other investigations with Pyrenones are concerned with the treatment of kraft boards and cotton bags to make them insect-resistant. Recently an adhesive containing Pyrenone was made available for certain packaged food products.

*Pyrenone is a registered trade-mark of U.S.I. It designates combinations of Pyrethrins and Piperonyl Butoxide.

Alloy Cast Steel For Use at Minus 423° F.

Development of a new alloy steel capable of fulfilling extraordinary engineering requirements of sub-zero service at operating temperatures as low as −423° F. has been announced. An austenitic cast ferrous alloy containing chromium and nickel, among other alloying constituents, the alloy steel is believed to have particular usefulness for low-temperature applications in the oil, chemical, and other processing industries.

Amino Acid Requirements Seen Increasing with Age

Experimental work with rats has shown a greater requirement of the sulfur-containing amino acids by the adult rat than by the growing rat. This difference may be explained by the fact that different types of anabolic reactions occur in the adolescent than in the adult. These changing anabolic reactions have different requirements for various amino acids. It is said that possible species differences in amino acid requirements would be expected, not so much on the basis of differences in the nature of anabolic reactions, as on the basis of differences in reaction rates.

TECHNICAL DEVELOPMENTS

Further information regarding the manufacturers of these items may be obtained by writing U.S.I.

For quick weighing in gravimetric analyses — without errors of reading, interpolation, and computation — a new direct-reading lab. balance is on the market. **(No. 508)**

A new solder gun, with a plastic housing, is said to be available for quick, radio-service type soldering. It is described as equipped with a small spotlight and having an extra tip for deep-chassis work. **(No. 509)**

A new paint remover, for spray application, is claimed to give nearly 100% removal of highly resistant paints. It is said to wash off easily and be non-corrosive, and is stable in storage for up to six months. **(No. 510)**

Adhesive strength greater than rivets is claimed for a new adhesive being used to bond brake linings to brake shoes. It is described as having twice the safety of rivets while doubling the brake's life. **(No. 511)**

New plastic sponges, said to have all the advantages of other sponges with none of the disadvantages, are claimed to be resistant to mild acids, alkalies, soaps, and washing compounds. They can be boiled, are velvet-soft when wet, and wipe dry like a chamois, according to the manufacturers. **(No. 512)**

Ammoniated lozenges and chewing gum, with added chlorophyll, have been developed which are said to be as effective as ammoniated dentifrices in releasing ammonium ions. **(No. 513)**

To combat eye, ear, nose and throat infections, a new sulfa drug is said to be superior in antibacterial activity. It is also claimed germs do not become resistant to it. **(No. 514)**

Easier car-starting at low temperatures — down to 20° below zero — is claimed for unique carburetor preheater. **(No. 515)**

Called "the successor to wax," a liquid plastic coating is available which reportedly forms a cellophane-like coating over varnished or painted surfaces, on either metal or wood. It is applied with a cloth, is quick drying, and forms a highly resistant and durable finish, the makers state. **(No. 516)**

Rubber products of any color are reportedly possible now with the development of an extremely fine-particle silica pigment which can be manufactured inexpensively and in quantity. **(No. 517)**

One-hand operation of wash bottles is possible now, it is reported, with new all-plastic wash bottles for lab use. A gentle squeeze of the bottle is said to eject a strong, easily controlled stream of fluid. **(No. 518)**

U.S.I INDUSTRIAL CHEMICALS, INC.

60 EAST 42ND ST., NEW YORK 17, N. Y. U.S.I. BRANCHES IN ALL PRINCIPAL CITIES

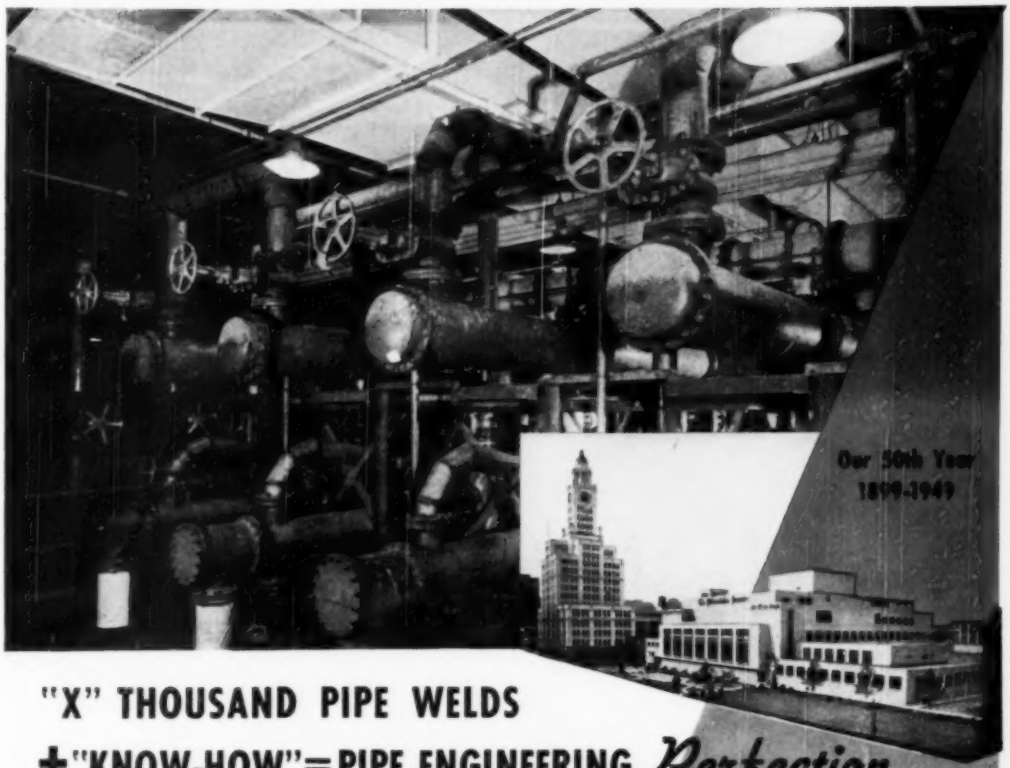
ALCOHOLS
Amyl Alcohol
Butanol (Normal Butyl Alcohol)
Fusel Oil—Refined
Ethanol (Ethyl Alcohol)
Specially Denatured—all regular and anhydrous formulas
Completely Denatured—all regular and anhydrous formulas
Pure—190 proof, C.P. 96%, Absolute
*Solox—proprietary solvent
ANTI-FREEZES
*Super Pyro Anti-freeze
U.S.I. Permanent Anti-freeze
***ANSOLS**
Ansol M
Ansol PR
*Registered Trade Mark

ACETIC ESTERS
Amyl Acetate
Butyl Acetate
Ethyl Acetate
OXALIC ESTERS
Dibutyl Oxalate
Diethyl Oxalate
PHTHALIC ESTERS
Diamyl Phthalate
Dibutyl Phthalate
Diethyl Phthalate
OTHER ESTERS
*Diatol
Diethyl Carbonate
Ethyl Chloroformate

INTERMEDIATES
Acetoacetanilide
Acetoacet-ortho-anisidide
Acetoacet-ortho-chloroanilide
Acetoacet-ortho-toluidide
Acetoacet-para-chloroanilide
Ethyl Acetoacetate
Ethyl Benzoylacetate
Ethyl Sodium Oxalacetate
ETHERS
Ethyl Ether, U.S.P.
Ethyl Ether Absolute—A.C.S.
FEED PRODUCTS
Riboflavin Concentrates *Vacatone 40
*Curbay B-G *Special Liquid Curbay
DL-Methionine
ACETONE
Chemically Pure

RESINS (Synthetic and Natural)
*Aroplaz—alkyds and allied materials
*Arofene—pure phenolics
*Arochem—modified types
Ester Gums—all types
Congo Gums—raw, fused & esterified
Natural Resins—all standard grades
INSECTICIDE MATERIALS
CPR Concentrates
Piperonyl Butoxide
Piperonyl Cyclonene
*Pyrenone Concentrates
Pyrethrum Products
Rotenone Products
INSECTIFUGE MATERIALS
*Indalone
Triple-Mix Repellents
OTHER PRODUCTS
Collodions Urethan, U.S.P.
Nitrocellulose Solutions
Ethylene

Printed in U.S.A.



"X" THOUSAND PIPE WELDS
+"KNOW-HOW"=PIPE ENGINEERING *Perfection*

Thousands of perfect pipe welds were required in the installation of 25 miles of stainless and carbon steel piping, six 22½ ton absorber tanks, blowers, pumps, etc., for the world's largest solvent recovery system in the Philadelphia Inquirer's rotogravure printing plant. The photograph above shows a few of the welded joints of complicated bends, headers, etc., we performed on stainless steel piping. Because the printing ink solvent is highly inflammable and corrosive, leakage or maintenance could not be tolerated. For safety reasons, most of the stainless piping is jacketed in carbon steel piping and embedded in sand and concrete. A job of this magnitude required the "know-how" of piping and mechanical engineering. Our 50 years' piping experience and modern shop facilities, equipped for large or small jobs, enabled us to perfect this installation far beyond minimum safety requirements. Also, for 30 years we pioneered in methods for handling stainless steel piping and now use the latest "inert-gas-shielded-arc" welding. You can depend on this long experience for your piping jobs requiring stainless, alloy or carbon steel.

WESTPORT JOINT

REPRESENTATIVES IN BOSTON, NEW YORK, CLEVELAND, MOBILE AND HAVANA

(PATENTED)

W. K. MITCHELL & CO., INC.

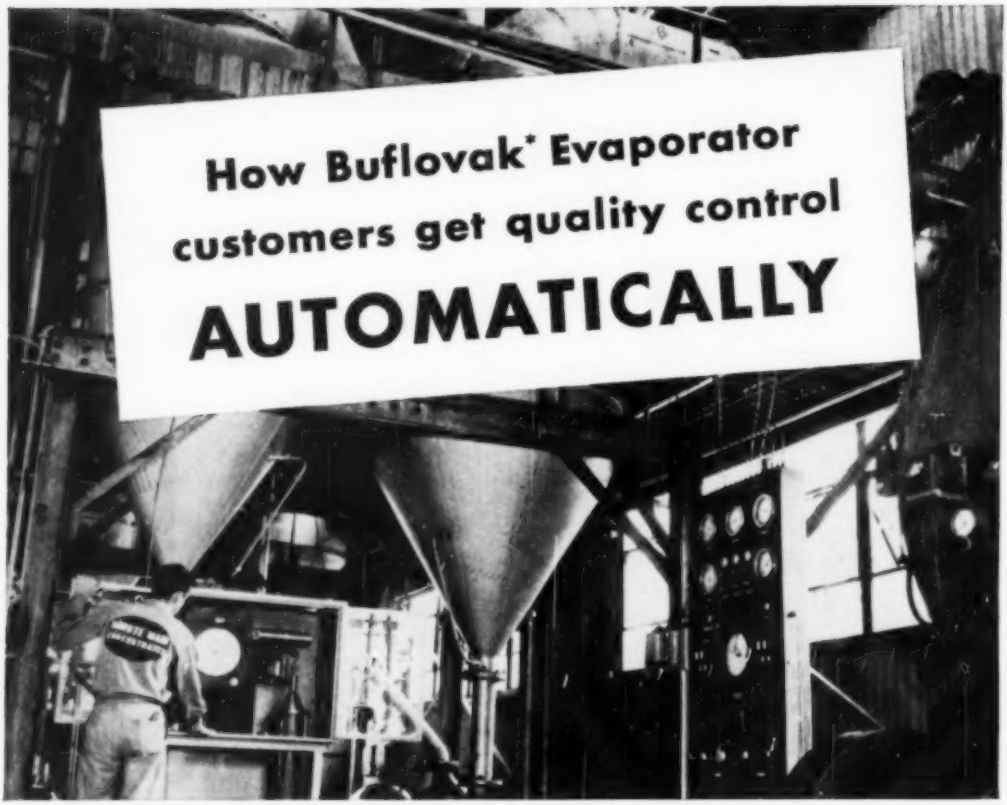
2048 ELLSWORTH STREET

PHILADELPHIA 46, PA.

SINCE 1899

MITCHELL

PIPING FABRICATORS AND CONTRACTORS



Taylor controls on double effect citrus fruit juice evaporator at Minute Maid Corp., Leesburg, Florida

BUFLOVAK* is a leading manufacturer of equipment for by-product recovery, processing chemicals, pharmaceuticals and food products. Many of their products go out to customers standard-equipped with Taylor Instrumentation—and that means something vitally important these days of sky-high labor and material costs—Automatic Quality Control.

Pictured above is a Buflovak Double Effect, High Vacuum, Low-Temperature Evaporator for the concentration of citrus fruit juices at Minute Maid Corp., Leesburg, Florida. This process won the highest Food Technologist award for 1949. That Taylor Fulscope Recording Controller (lower left) maintains proper density of product being withdrawn from the evaporator by operating a variable speed pump.

Most efficient use of the heating surfaces is assured by the aneroid type liquid level controller on the first and second effects. This type of manometer is recommended for the processing of food products.

The absolute pressure of the second effect is controlled by regulating the flow of water to the condenser.

This installation is another example of an equipment manufacturer developing a complete processing unit, then calling in Taylor to give it a "brain" in the form of automatic control. Thousands of Taylor Automatic Control Systems are operating successfully at almost every phase of industrial processing. That's why we say, when modernizing present or ordering new processing equipment, specify "Taylor-Equipped As Usual!" Taylor Instrument Companies, Rochester, N. Y., and Toronto, Canada. *Instruments for indicating, recording and controlling temperature, pressure, humidity, flow and liquid level.*

**Buflovak Equipment Division of Blaw-Knox Co., Buffalo, N. Y.*

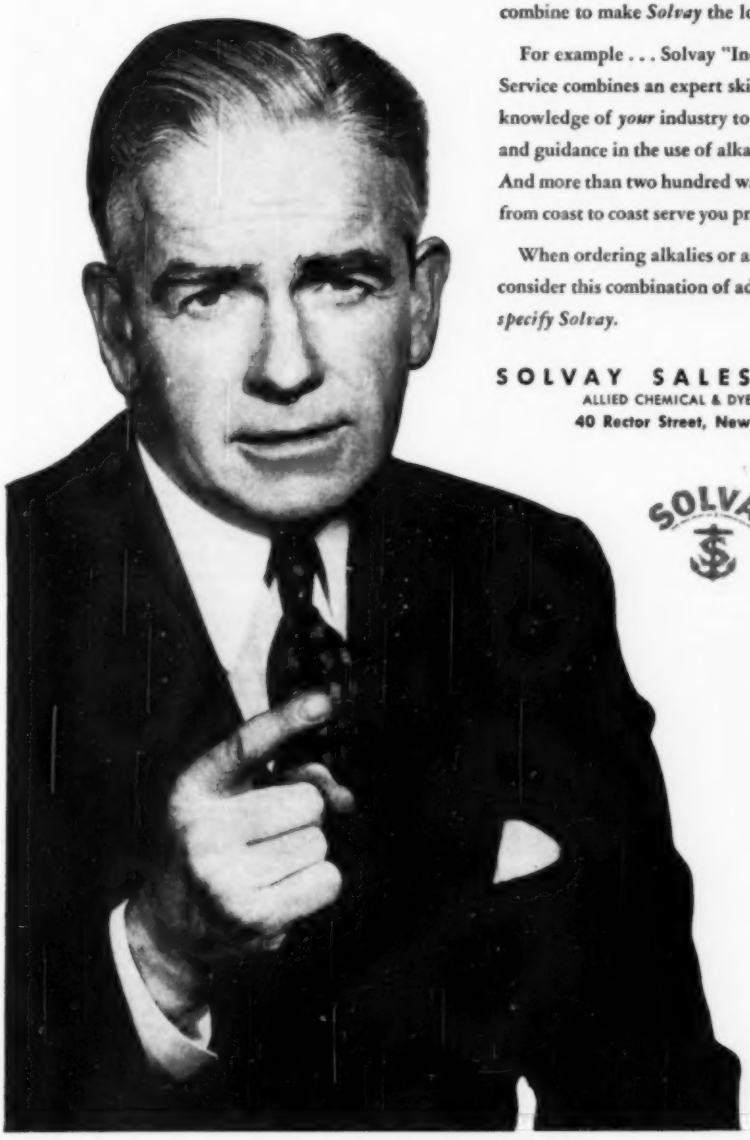
Taylor Instruments
MEAN
ACCURACY FIRST
IN HOME AND INDUSTRY

"Why You Should Specify SOLVAY"

Chemicals are not bought on the basis of price and specifications alone. Other factors must be considered . . . plant facilities, plant locations, length of experience, Technical Service, convenience of warehouse locations for prompt and economical delivery. All these combine to make *Solvay* the logical choice for alkalies.

For example . . . Solvay "Industry-Wise" Technical Service combines an expert skill in alkalies with an intimate knowledge of *your* industry to offer invaluable counsel and guidance in the use of alkalies and associated chemicals. And more than two hundred warehouses and stock points from coast to coast serve you promptly and economically.

When ordering alkalies or associated chemicals, consider this combination of advantages and you, too, will *specify Solvay.*



SOLVAY SALES DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

SOLVAY

- Soda Ash
- Caustic Soda
- Caustic Potash
- Chlorine
- Potassium Carbonate
- Calcium Chloride
- Nytron
- Sodium Bicarbonate
- Specialty Cleansers
- Ammonium Bicarbonate
- Sodium Nitrite
- Para-dichlorobenzene
- Ortho-dichlorobenzene
- Monochlorobenzene
- Methanol
- Ammonium Chloride
- Formaldehyde

VisQueen* film drum liners revolutionize bulk shipping... save up to $50,000

FIBER DRUM with Visqueen film liner. It's the answer to the chemical industries' prayer! High tensile strength, tear resistance and chemical inertness make Visqueen film-lined fiber drums perfect for shipping a wide variety of chemicals, at lower cost. Visqueen film is unaffected by acids or alkalis, extremes of temperature.

USERS OF BOTH FIBER AND STEEL SHIPPING CONTAINERS HAIL IMPORTANT NEW DEVELOPMENTS

White-hot interest is now being centered by hundreds of manufacturers on a brand-new method of bulk shipping—a method that is absolutely without equal for product protection and shipping economies. One shipper reports 66⅔% tare weight reduction—annual shipping charge savings of $50,000.

Developed by The Visking Corporation engineers in cooperation with leading converters, the new method combines the virtues of Visqueen film with either fiber drums, cartons, or steel drums—to produce a complete shipping "package" of practically limitless possibilities.

Study the examples shown here and relate them to your own individual shipping problem. It's 100 to 1 that you'll spot a clue to spectacular savings for your firm!

LIQUIDS • SEMI-LIQUIDS • SOLIDS— ALL CAN BE SHIPPED SAFELY IN VISQUEEN FILM-LINED CONTAINERS

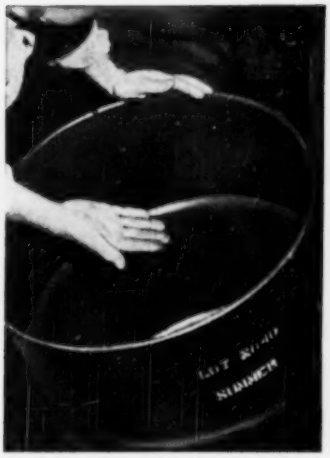
Running the gamut from frozen strawberries to automobile undercoating, practically any bulk product can be shipped safer and more economically in containers lined with new Visqueen film-lined containers.

Savings in handling, savings in time and money are winning more and more shippers over to the new method of shipping. A glance at the figures shown on this page will tell you why!

VISQUEEN film, the radically new liner for both steel and fiber shipping containers, is a strong, clear, odorless, tasteless polyethylene film, having an unusual combination of chemical and physical properties. Chemically inert, acids and alkalis don't affect it. Won't stick to itself or products it contacts. Extremes of temperature don't bother VISQUEEN film—even 94 degrees below zero F. left it strong and flexible (Frozen food people, please note!). Waterproof and moisture-resistant, VISQUEEN film is particularly valuable for sealing pure chemicals and foods during shipment. Protects flavor and purity, does not permit foods to pick up "off" flavors or odors—yet permits products to "breathe." Has shown no tendency to allow or sustain mold growth.

RECTANGULAR FIBER CARTONS? Sure thing! Visqueen film liners are available for any size of rectangular cartons, for the convenient, low-cost shipping of chemicals and other products in semi-liquid and solid form. For savings and product protection, investigate the possibilities of this revolutionary new packaging technique.

SAVINGS for steel drum shippers! Visqueen film liners used with steel drums are the perfect answer for shippers of "difficult" chemical products. Insulates them from metal, prevents reaction with metal of container. Assures 100% purity when product reaches destination. Ideal for liquids or semi-liquids. Eliminates leakage.



LOOK! NO CLEANING! No matter how sticky or messy the product shipped in Visqueen film-lined drums—drums are instantly ready to go back into service with NO CLEANING or RECONDITIONING. Just zip out Visqueen film liner. Nothing sticks to interior of drum—it's clean as new! No waste—100% product recovery.

If your shipping problem is concerned with any of these fields—you can save money and time with Visqueen film-lined shipping containers

- Dry hygroscopics
- Corrosives
- Acids
- Alkalis
- Cyanide concentrates
- Silver nitrates
- Wetting agents
- Solvent adhesives
- Acid or alkali reaction adhesives

SAVINGS EFFECTED ON TYPICAL SHIPMENT FROM CALIFORNIA TO CHICAGO

Rate: $1.96 per 100 lbs.
Quantity: 150 containers per car

Former container tare per car	7,500 lbs.	or $147.00
VISQUEEN film-lined fiber drum tare per car	2,100 lbs.	or *$41.16*
Total saved per car	5,400 lbs.	or $105.84

WARNING!
Do Not Confuse VISQUEEN with Ordinary Polyethylene Film

All polyethylene film is not VISQUEEN. VISQUEEN is the product of years of experience and research on the part of The Visking Corporation, pioneers in the development of this material. Only VISQUEEN has the benefit of this rich technical background. Always be sure to specify VISQUEEN Film.

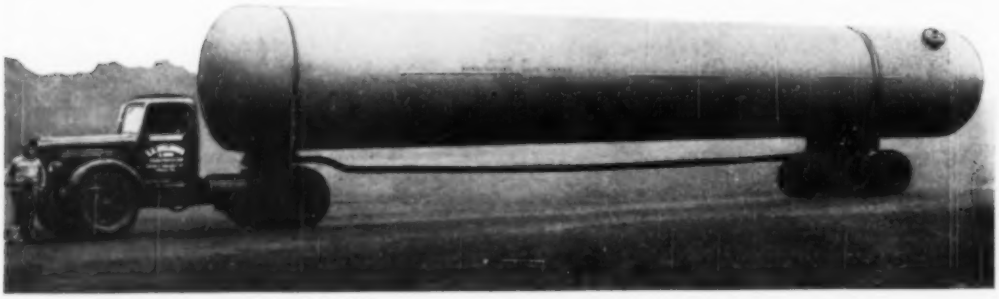
VisQueen* FILM
A PRODUCT OF
THE VISKING CORPORATION
PRESTON DIVISION • TERRE HAUTE, INDIANA
*Reg. U. S. Pat. Off.

THE VISKING CORPORATION
Box D1410, Terre Haute, Indiana

Gentlemen:
YES! I want to be shown how VISQUEEN FILM LINERS can save me cold cash on every shipment.

Name .....
Firm .....
Address .....
City ..... State .....

30,000 GALLON PROPANE STORAGE TANK...



...ANOTHER EXAMPLE OF CORRECT MATERIALS and FABRICATION METHODS BY *DOWNINGTOWN*

This big job is one of four such units recently trucked to Chester, Pa. To fabricate work satisfactorily, it is necessary to know proper welding procedures; the correct choice of welding electrodes for various types of metals, etc.

To accomplish this purpose, DOWNINGTOWN has pre-determined welding procedures (which are constantly checked and improved); a welding supervisor; X-Ray and other technicians studying materials and methods.

Our experience and constant research in fabricating various grades of Carbon Steel, Stainless Steels, Nickel-Clad, Stainless-Clad, Monel-Clad, Cupro-Nickel, Aluminum, etc., may be of help to you. We are fully equipped with the most modern facilities to handle complete jobs, within our limitations, in the *correct* materials and methods of fabrication required to assure operating efficiency.

DOWNINGTOWN also maintains a Heat Transfer Division under the direction and supervision of men thoroughly trained and experienced in this field.

Engineering Consultation is *at your service*, to aid you in preparation of plans and or specifications for definite jobs.

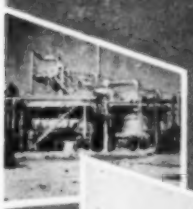
DOWNINGTOWN IRON WORKS
DOWNINGTOWN, PA.
WELDED and RIVETED PRODUCTS

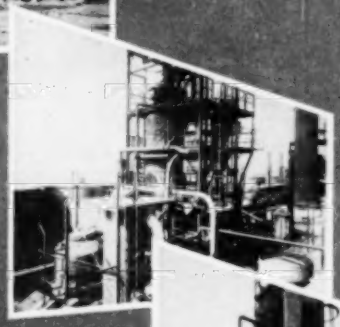
NEW YORK OFFICE: 30 CHURCH ST.

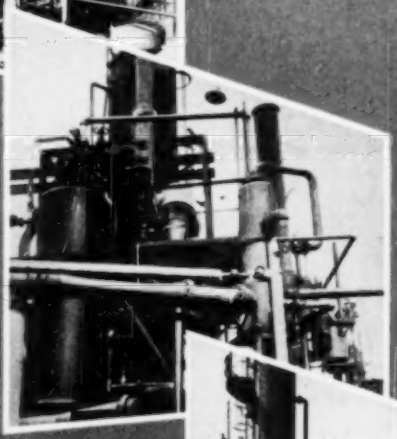
FOSTER WHEELER

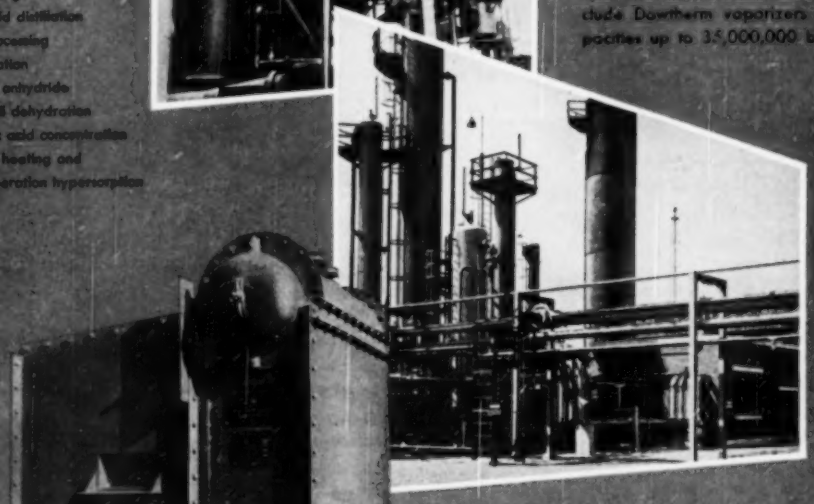
DOWTHERM HEATED PROCESS SYSTEMS

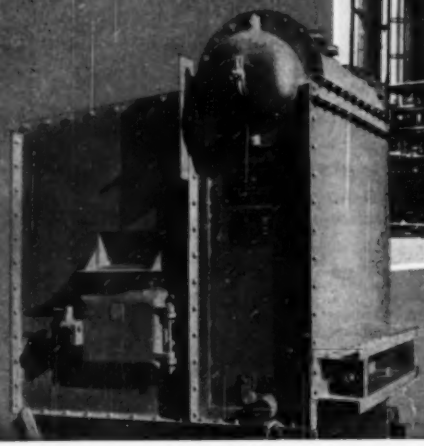
designed, fabricated and erected under one responsibility and with one overall guarantee











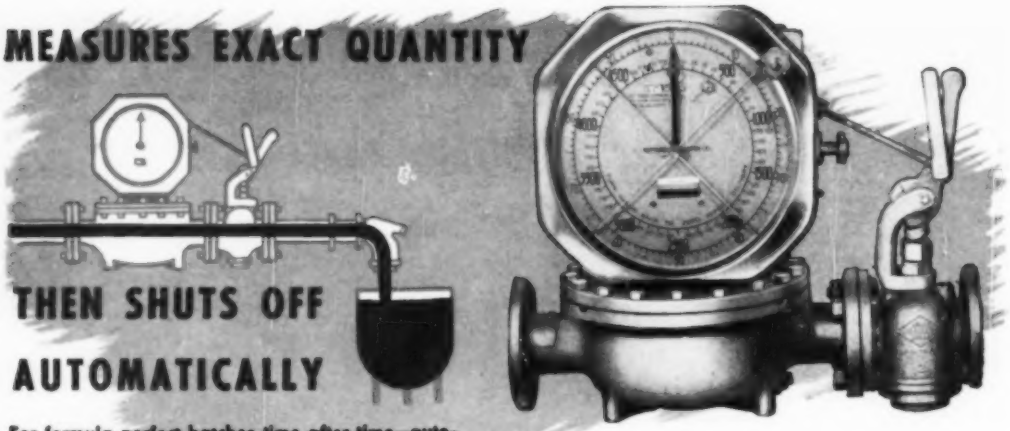
When making an installation of a Dowtherm heated process system in your plant, it is essential that all heating equipment and interconnecting piping, as well as the Dowtherm vaporizer, be properly designed and furnished by a manufacturer with sufficient background in this type of work to know the special problems involved. In 1932 Foster Wheeler Corporation, builders of heat exchangers and direct fired boilers and heaters for the past 50 years, was the first manufacturer to design, engineer, and construct a complete Dowtherm heated process system. Since that time, Foster Wheeler has installed more than 300 vapor generators and—in most cases—has supplied and engineered the entire systems. Some of these installations include Dowtherm vaporizers with capacities up to 35,000,000 btu.

...solids oil deodorization
...oil bodying
...fatty acid distillation
...resin processing
...esterification
...phthalic anhydride
...castor oil dehydration
...sulphuric acid concentration
...catalyst heating and
...regeneration hypersorption

FOSTER WHEELER CORPORATION
165 Broadway, New York 6, N. Y.

FOSTER WHEELER

MEASURES EXACT QUANTITY



THEN SHUTS OFF AUTOMATICALLY

For formula-perfect batches time after time—automatically—simply set quantity of liquid desired, open valve, and this Neptune Auto-Step meter does the rest. Stops waste of valuable ingredients, prevents overdilution with water that must later be removed. Think of the savings possible in your own batch mixing!

LET'S LOOK AT SOME CASES:

Five Trident Auto-Stop meters accurately measure water, starch water, and clay slurry into mixers in this mid-western plant.

Hundreds of Neptune Auto-Stop meters like this control moisture of concrete in ready-mix plants, and of sand in foundries.

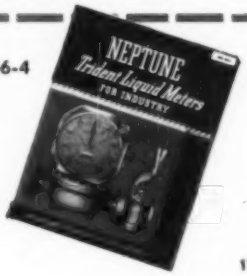
Water is automatically measured into washers by Neptune Trident Auto-Stop meters. Other Neptune meters measure soap, cleaning fluids, brine.

Long Island bottler maintains product uniformity by accurately metering both water and liquid sugar into syrup mixing kettles. At left is 1" Auto-Stop; at right is 2" Auto-Stop.

Ten non-automatic Trident meters in this New York candy plant measure both corn syrup and liquid sugar the easy way—right into the kettles.

NOW TAKE A LOOK AROUND *Your Plant*

Ask for Industrial Metering Bulletin 566-4



NEPTUNE *liquid* METERS

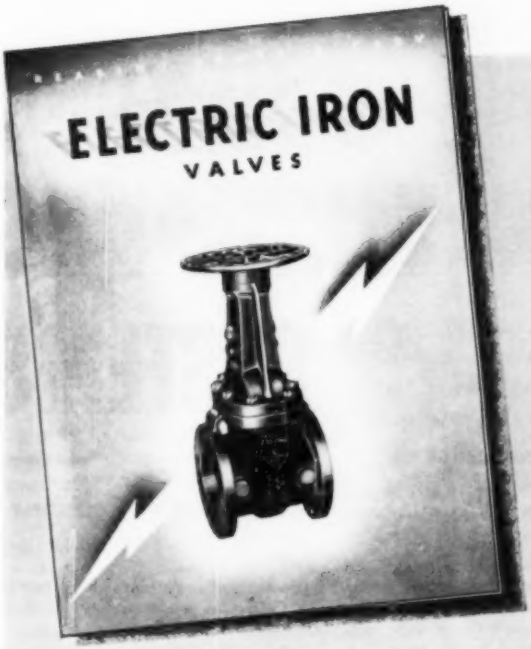
NEPTUNE METER COMPANY
50 WEST 50TH STREET, NEW YORK 20, N. Y.

Branches: Atlanta, Boston, Chicago, Dallas, Denver, Kansas City, Mo., Los Angeles, Louisville, Philadelphia, Portland, Ore., San Francisco, and Long Branch, Ontario

15-6

BETTER IRON MAKES BETTER VALVES AT READING-PRATT & CADY

There is one *BEST* method of melting and refining iron for valve castings. It is R-P&C's *Electric Furnace method.*

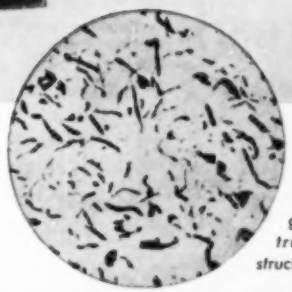


THIS FOLDER tells you why Electric Iron is better than iron made by the conventional cupola process. Interesting information if you buy or specify iron valves. Write for DH-18.

YOU PAY NO PREMIUM for the extra quality in R-P&C Electric Iron Valves. But you do get better valves — longer lasting, more dependable.

Electric Furnace Cast Iron is a low-sulphur, low-phosphorus iron of homogeneous, fine-grained structure. It is clean and of uniform quality.

Before buying or specifying iron valves, get the complete story of R-P&C Electric Furnace Iron. Write for our descriptive folder—DH-18.



UNIFORM STRUCTURE
Photomicrograph (enlarged 100 times) shows even distribution of fine graphite flakes. This contributes to the uniform structure of R-P&C Electric Iron.

ACCO

Reading, Pa. • Atlanta • Baltimore • Boston • Chicago • Denver • Detroit • Houston
New York • Philadelphia • Pittsburgh • San Francisco • Bridgeport, Conn.

READING-PRATT & CADY DIVISION
AMERICAN CHAIN & CABLE

PRECIPITRON® ADDS REAL VALUE TO YOUR VENTILATING SYSTEMS

Refrigeration Compressors

Axial Flow Fans

Heating and Cooling Coils

BY SAVINGS

PRECIPITRON, the electronic air cleaner, collects 90% of all airborne dust, dirt, and soot particles. Result:

Reduced Waste — Fewer "seconds" and rejects where products are harmed by dust and dirt.

Less Maintenance — Protects walls, ceilings, fixtures and machinery, keeps them cleaner; drastically cuts interior maintenance.

Better Production—Clean, fresh air means happier, more efficient employes.

BY OPERATING ECONOMY

PRECIPITRON in a ventilating system means:

Low Operating Costs—The PRECIPITRON cell has a constant minimum resistance to air flow.

Inexpensive Maintenance—Simply wash out the collected dirt and apply adhesive to restore peak operating efficiency.

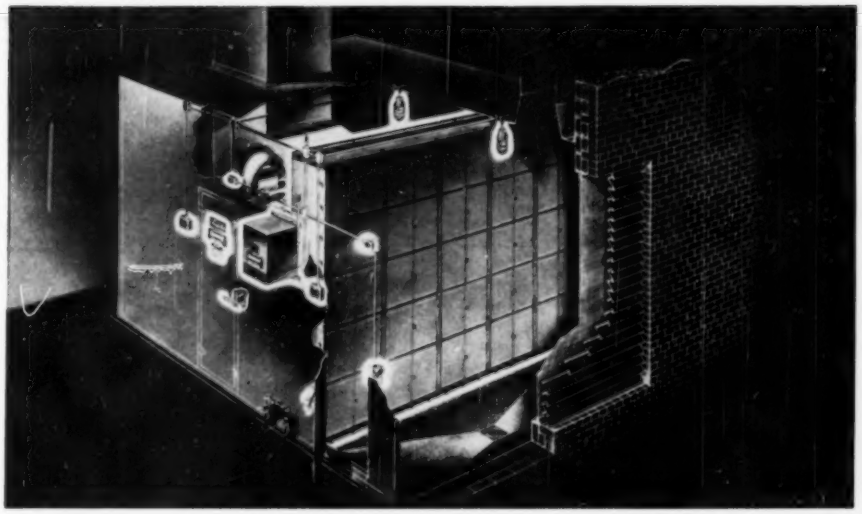
Everything that puts air to work for Every application

Refrigeration Condensers

Centrifugal Fans

Unit Air Conditioners

*Reg. U. S. Pat. Off. I-80157



Withstands Corrosion — All-aluminum construction has higher resistance to rust and corrosion without protective coatings.

BY QUALITY

The new, all-aluminum PRECIPITRON is more effective than ever.

More Compact — 25% more plate area per cell, a more compact installation that saves valuable space.

Easy to Install — Building block design makes it easy to assemble, install and maintain; gives greater flexibility of arrangement.

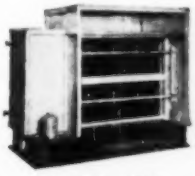
Lightweight — Heaviest piece weighs only 50 pounds, every part except power pack can be handled by one man without special equipment.

Investigate this new PRECIPITRON for savings and economical operation in your ventilating systems. In the final analysis, PRECIPITRON is not expensive to own or operate when the real value of *truly clean* ventilating air is properly considered. For information, call your nearest Westinghouse office, or write directly to Westinghouse Electric Corporation, Sturtevant Division, Hyde Park, Boston 36, Mass.

Westinghouse
Sturtevant Division

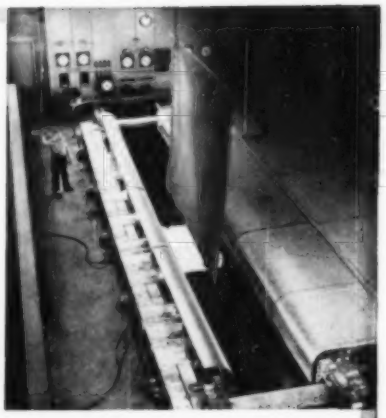
Unit Heaters

Air Handling Units



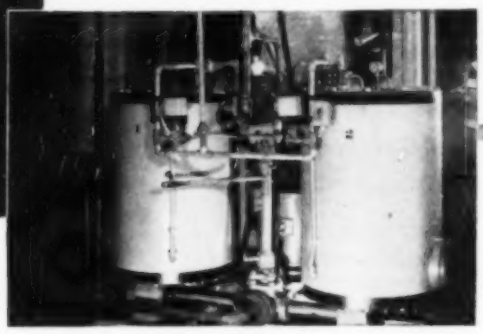
Surface Dehumidifiers

DRYing helps produce that extra-smooth finish on Lukens Clad Steel Plate



Lowering a plate into a molten caustic bath at Lukens Steel Company, Coatesville, Pa. Sodium hydride reduces the scale to elemental iron, which is then flushed off the plate.

Hydrogen is produced from anhydrous ammonia by these two Westinghouse dissociators. Free ammonia and all moisture are removed from the gas by this Lectrodryer. →



Sodium hydride is produced by the reaction of sodium and hydrogen. Carried in a molten caustic bath, it reduces metallic scale to a sponge metal or lower oxide. This is then flushed off, leaving the surface of the plate smooth and regular, and free of scale.

It's a precision process. For example, the hydrogen is dried DRY and only a few parts of ammonia per million remain. Lectrodryer does that job.

In thousands of plants all over the world, Lectrodryers are performing a similar service—DRYing air, gases and organic liquids to low dew-points. As a result, delicate reactions are kept on the beam, materials in raw and finished storage, and in process are safeguarded against damage by unwanted moisture.

Bulletin 216 pictures many of these DRYing operations in various industries. It may help you determine how you can use Lectrodryers to advantage. For a copy, write Pittsburgh Lectrodryer Corporation, 303 32nd St., Pittsburgh 30, Pa.

In England: Birlec, Limited, Tyburn Road, Erdington, Birmingham.
In Australia: Birlec, Limited, 51 Parramatta Road, Glebe, Sidney.

LECTRODRYERS DRY WITH ACTIVATED ALUMINAS

LECTRODRYER

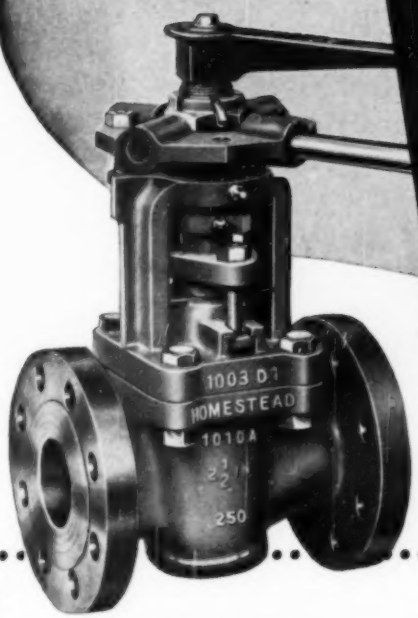
REGISTERED TRADEMARK U. S. PAT. OFF.

~~Corrosion~~...~~Temperature~~...~~Pressure~~

Can't faze

HOMESTEAD
Lever-Seald
VALVES

They're Stick Proof



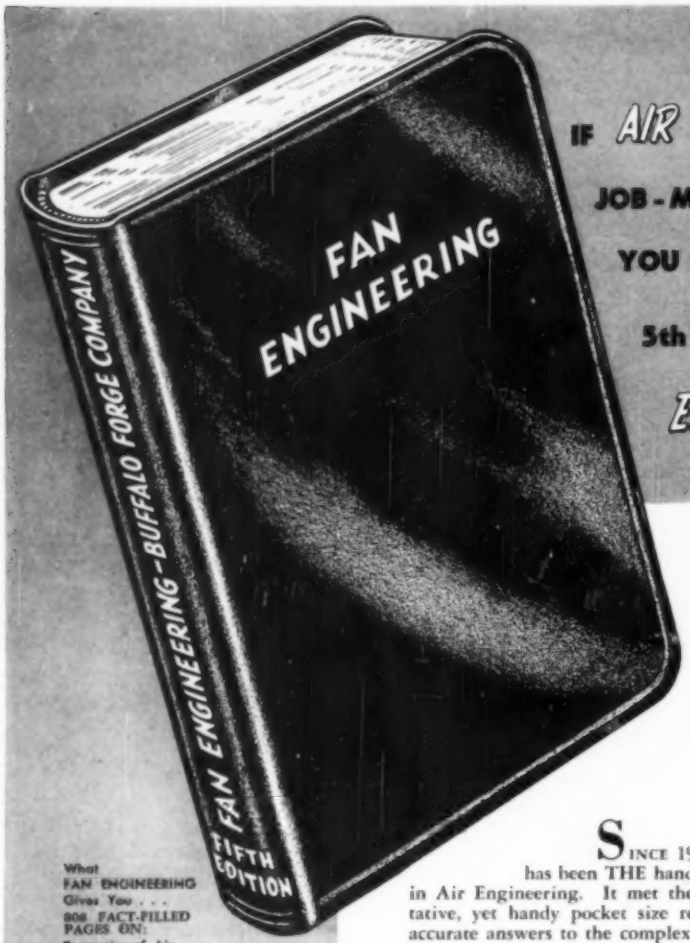
- Instant Stick-Proof operation.
- Quarter-turn fully opens or closes.
- Positive seal without lubrication.
- Seating surfaces always protected in both open and closed positions. Corrosion practically eliminated.
- Unobstructed straight-line fluid flow.
- All operating parts protected from damaging effects of service conditions and weather.

For 16 years, they have been first choice for difficult services where extremes of temperature or pressure or corrosive line fluids cause ordinary valves to "stick" or "seize." Due to their exclusive "Lever-Seald" construction, they render instant, Stick-Proof service. They operate fast, too . . . full open or close in a quarter-turn . . . 16 to 28 times faster than screw-stem-type valves. And because all operating parts are protected from the damaging effects of line fluids, service conditions and weather, long life, low maintenance and trouble-free service are assured.

HOMESTEAD LEVER-SEALD VALVES are made in metals and alloys to meet service requirements; sizes 1½" to 12"; for pressures from vacuum to 1500 pounds.

Send for your copy of Reference Book No. 39-3. No obligation.

HOMESTEAD VALVE MANUFACTURING CO.
"Serving Since 1892"
P. O. BOX 13 CORAOPOLIS, PA.



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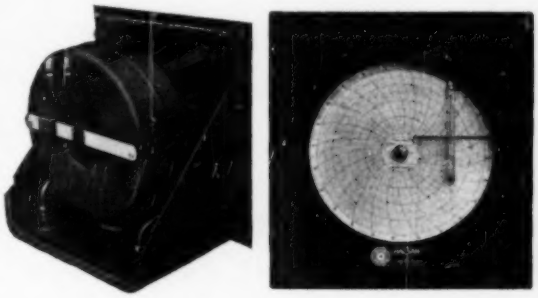
Sensitive...accurate...reliable

Hagan Ring Balance Draft Gage

. . . measures positive, negative or differential pressures as low as 0.2 inch water column, full scale, and as high as 100 inches



The basic principle of the Hagan Draft Gage is the same as that of the Hagan Ring Balance Flow Meter. It is a radial torque device which uses a hollow ring body to convert difference in static pressure into a rotation which is transmitted to recorder or indicator. The ring body is partially filled with a sealing fluid, and is divided into two compartments by means of a baffle in the upper part of the ring.

As in the Flow Meter, there is an opening in the ring on each side of the baffle. One of these openings is connected to the pressure to be measured; the other is open to the atmosphere. The difference between this pressure and the pressure of the atmosphere — whether positive or negative — causes rotation of the ring body. The ring moves through an arc of 15°, with a radius of 5 to 5½ inches, thus giving far greater total movement than any other type of draft gage.

The ring assembly is mounted on a knife-edge bearing. This mounting, plus the fact that there are no stuffing boxes, virtually eliminates friction. There is no diaphragm to dry out, no bellows to crack or corrode. Unexpected pressure rises do not damage the gage or affect its accuracy. At the most, a sudden high pressure will do no more than drive the sealing fluid from the ring body, and as soon as the fluid is replaced the gage is again ready for use.

For full information on Hagan Ring Balance Draft Gage, fill in the coupon below or write to Hagan Corporation, Hagan Building, Pittsburgh 30, Pa.

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RING BALANCE FLOW AND PRESSURE INSTRUMENTS
THRUSTORQ FORCE MEASURING DEVICES
BOILER COMBUSTION CONTROL SYSTEMS
METALLURGICAL FURNACE CONTROL SYSTEMS

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Ring Balance Meter Division
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Pittsburgh 30, Pa.

Please send information concerning Hagan Ring Balance Draft Gage.

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Company _____

Position _____

Street _____

City _____ State _____

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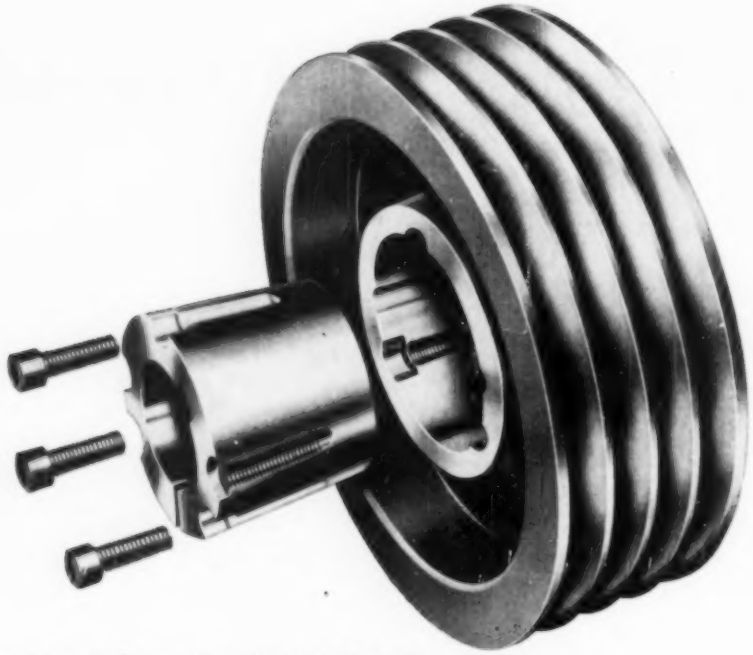

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FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY,
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GEARED DRIVES MEET GROWING DEMANDS FOR POWER-SAVING EQUIPMENT IN INDUSTRY

Continuous-tooth Herringbone
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Type "H" Worm Gear

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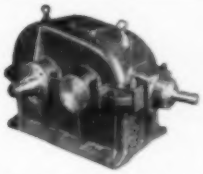
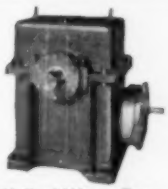
Motorized Reducers



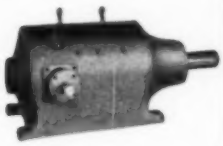
Spiral Bevel Herringbone

Double Worm Gear

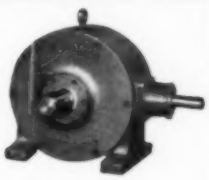


Helical Worm Gear

Motorized Worm Gear



Right Angle Gear Reducer



Spiral Bevel Gear

D.O.James Gear Manufacturing Co. is constantly developing and continuing to improve its variety of gear speed reducers—enabling engineers and designers of power-saving equipment to meet and cope with space limitations, horsepower requirements, ratios, location of driven or driving shafts and the type of drive that the many and varied installations require. Catalogs are available containing complete informative engineering data that will assist in the selection of the type of reducer for the specific job to be done.

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Since 1888—Makers of Cut Gears, Gear Reducers and Flexible Couplings

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If you're all "gummed up"

in a tough heat transfer problem

Specify..

Vogt Spiral, Spring Type Scraper
Patent No. 2,117,175

Vogt

SCRAPER TYPE

CHILLERS

Photos show shop assembly without driving motor.

Fouling of the inner pipe surfaces of Vogt Chillers is eliminated, because they are swept clean continuously during operation by patented spiral, spring type scrapers. And these clean surfaces achieve the highest possible rate of heat transfer between the solution and the refrigerant.

VOGT DOUBLE PIPE TYPE CHILLERS are designed to use ammonia, brine, or cold dewaxed oil as the cooling medium. Oil or brine, when employed, is circulated through the jacket pipes countercurrent to the flow of the solution in the inner pipes.

MULTI-PIPE TYPE CHILLERS, for direct expansion, have large jacket shells each containing seven inner pipe sections and employ volatile refrigerants such as ammonia, freon, propane, etc.

Our engineering staff is qualified by training and experience to help you find the right answers to your heat transfer problems. Their recommendations are available without obligation.

Vogt FOR BETTER CHILLERS

HENRY VOGT MACHINE CO.
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"Looks like Bascom has fallen in love with that new, Reeves-equipped machine"

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VARIABLE SPEED TRANSMISSION for providing infinite, accurate speed flexibility over a wide range—2:1 to 16:1. Sizes—fractional to 87 hp.

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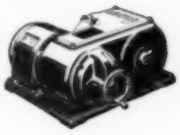

Give your workers machines that are equipped with REEVES Speed Control and they'll give you a better, more profitable day's work. With the turn of a wheel or touch of a button, each individual operator can obtain—instantly and accurately—the precise machine speed at which he can turn out the *most* work and the *best* work commensurate with his own, individual ability. Make sure the new machines you buy are REEVES-equipped. Install REEVES Speed Control on machines already in service. Your employees will appreciate it . . . and you will appreciate it when you see the resultant improvement in quantity, quality and cost of production. Write for Catalog No. CE21-3N.

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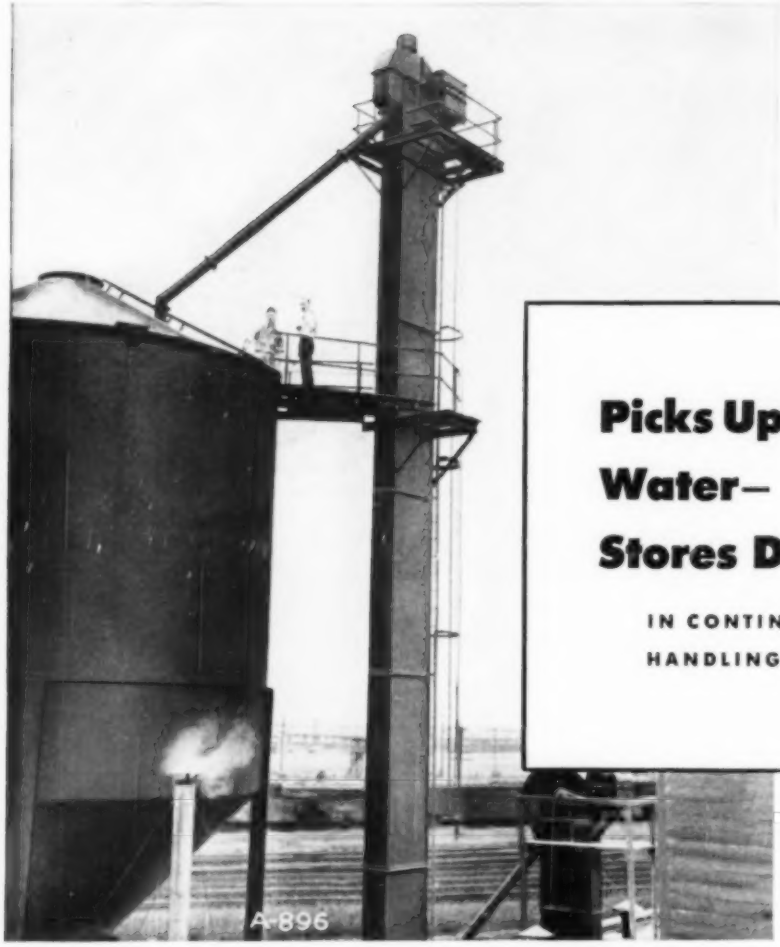
Recognized Leader in the Specialized Field of Speed Control Engineering

ACCURATE • VARIABLE

Reeves Speed Control

GIVES THE RIGHT SPEED FOR EVERY JOB!



Picks Up Under Water— Stores Dry . . .

IN CONTINUOUS HANDLING FLOW

The problem of handling alumino silicate . . . used as a catalyst in producing high octane gasoline . . . was solved by a skillfully planned combination of S-A bulk materials handling units. Material is moved from underwater pickup . . . through drying and processing stages . . . to storage.

For nearly 50 years, S-A engineers have been planning and installing bulk handling systems of all types, large and small . . . all designed and equipped to handle material in the required volume at the lowest possible cost per ton.

If you have a bulk handling problem, get the S-A engineers' recommendations . . . there is no obligation. Write us today.

NATIONAL ALUMINATE CORP. CHICAGO, ILLINOIS

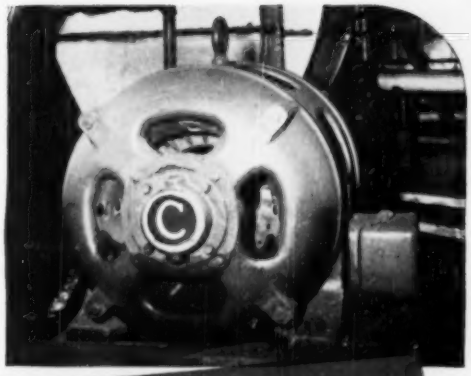
A REDLER Conveyor picks up crystallized alumino silicate from a tank of water and conveys to a rotary drying kiln . . . special REDLER casing drains off most of the moisture while conveying. A water-jacketed ribbon conveyor picks up dried gel and cools while it conveys to milling and processing. Screw conveyor then feeds to 75-foot high bucket elevator to outdoor storage tank over railroad siding. S-A rotary air-lock gate regulates flow thru flexible spout to hopper cars.

STEPHEN S-A DAMSON MFG. CO.

3 Ridgeway Avenue, Aurora, Illinois · Los Angeles, Calif. • Belleville, Ontario

DESIGNERS AND MANUFACTURERS OF ALL TYPES OF BULK MATERIALS HANDLING EQUIPMENT

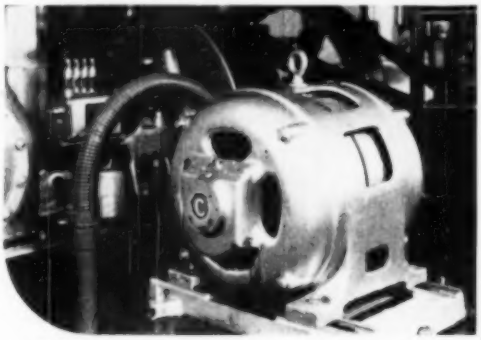
Century 40 horsepower, type SC motor driving an induced draft fan for a stack.



From Century's Line of Electric Motors You Can Select

1. **Right Kind**—*to match your current supply*
2. **Right Type**—*to meet your load characteristics*
3. **Right Protection**—*against atmospheric hazards*
4. **Right Size**—*from 1/6 to 400 horsepower*

Century 150 horsepower, type SC motor driving a two-stage centrifugal pump in a city water plant.



Two Century 75 horsepower SC high torque motors driving refrigeration compressors.

The wide range of kinds, types and sizes of Century motors makes it possible to select a standard motor to meet the requirements of all popular applications.

They are available for both AC and DC current—high, normal and low torque characteristics. Types are also available for applications requiring varying speeds and reversing direction of rotation.

To protect against atmospheric hazards, Century motors are enclosed in open rated drip proof, splashproof, totally enclosed fan cooled and explosion proof frames. Many types are available with vertical and flange mountings as well as standard horizontal bases.

Specify Century motors for all your electric power requirements.

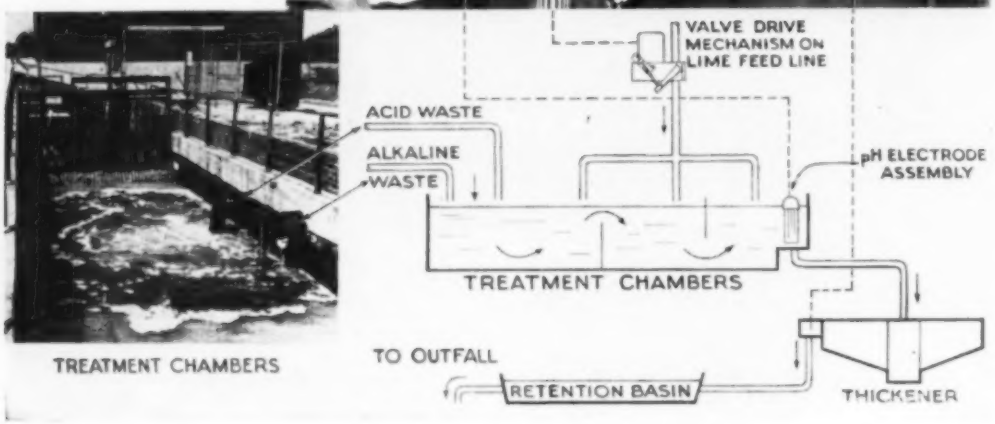
Popular sizes and standard ratings are generally available from factory and branch office stocks.

Century C MOTORS

CENTURY ELECTRIC CO.
1806 Pine Street, Saint Louis 3, Missouri
Offices and Stock Points in Principal Cities

-624

In this waste treating system of a textile plant, any pH change at the treatment chambers (below) causes a Micromax controller (right) to readjust flow of lime for neutralizing acid waste. Micromax recorder at far right charts "averaged out" pH of treated waste as it flows to outfall.



How pH control helps "chemical neighbors"

What's the best yardstick for keeping good "chemical neighbors"? If plant wastes are largely acid or alkaline liquids, it's usually the pH value of the wastes flowing from the outfall. For correct pH is the final assurance that such wastes are meeting good stream requirements . . . that there's no pollution.

Whenever a plant has the problem of controlling pH on its waste neutralization system, L&N can help . . . effectively. We can assist plant engineers in setting up . . . *and maintaining* . . . good chemical relations with the rest of the community.

Jl AD ND44-96-708(3)

Through our proved method of "controllability analysis", pH control limits of a plant's waste treating system can be closely predicted. Or, minimum retention capacities needed to hold treated wastes within specified pH limits can be determined accurately. By weighing *all* pH control factors—type of waste, treating system, reagent—controllability analysis predetermines the *net control effect* possible, either from already-installed equipment or from a plant still in blue-print stage.

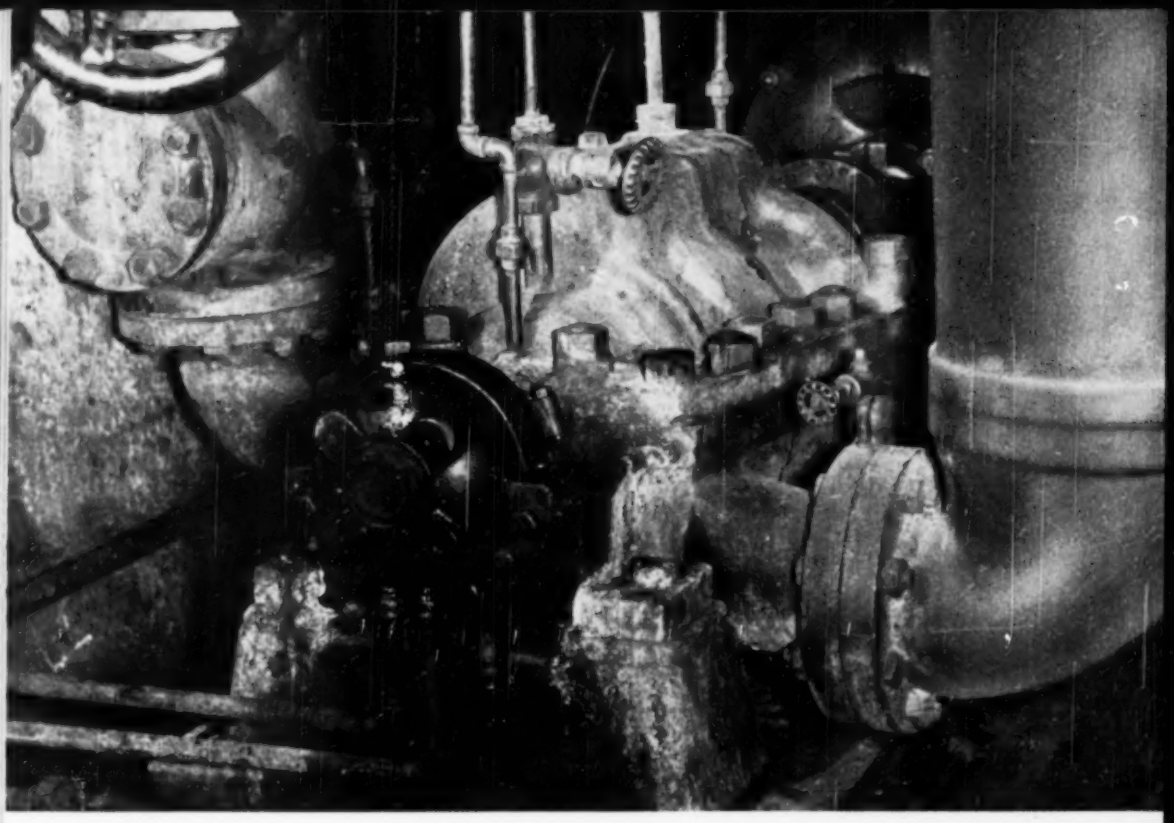
Just write Leeds & Northrup Co., 4916 Stenton Ave., Phila. 44, Pa.

Remember . . . if you're planning pH control, "controllability analysis" can help. Send for *Bulletin ND44-96-708* today.

This handy booklet contains a simple questionnaire, so we can help you begin solving your plant's pH problems *now*.

LEEDS & NORTHRUP

MEASURING INSTRUMENTS · AUTOMATIC CONTROLS · TELEMETERS
HEAT-TREATING FURNACES



Pump puts the "heat" on grease

HEAT from the shaft of the boiler feed pump shown above kept a conventional grease in plenty of trouble. The severe conditions caused the grease to oxidize and gum up on the pump's ball bearings. Consequently, the bearings overheated. Grease had to be applied every few hours. The pump had to be shut down frequently so that the bearings could be cleaned.

Officials of this plant put their problem to a Standard Oil Lubrication Engineer. The Engineer recommended Stanolith Grease No. 57, a lithium-soap product with the unique ability to withstand both heat and water.

On the bearings, Stanolith stood up under the high temperatures. It would also resist any water washing should leaks develop. Over-heating troubles were stopped. Downtime was eliminated. Instead of the previous daily greasings, only one application of Stanolith was required each week—an important saving of both lubricant and labor.

Lubrication problems caused by heat, water, or low temperatures in your plant can be solved by this *one* lubricant: Stanolith Grease. Through its remarkable versatility, you can avoid the cost and trouble of stocking and using a variety of special greases. A Standard Oil Lubrication Engineer will help you make these savings.

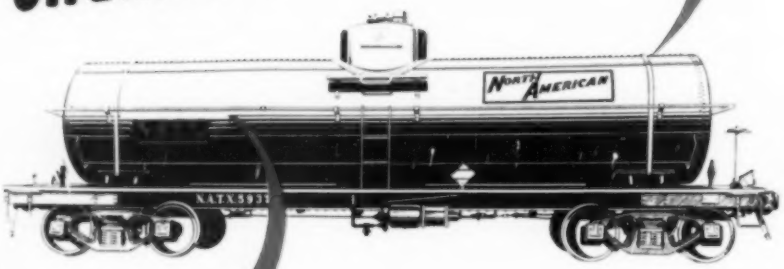
Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

PROBLEM SOLVED BY...

Stanolith Grease

STANDARD OIL COMPANY (INDIANA) STANDARD

THIS SYMBOL MEANS SAFETY FOR CHEMICAL SHIPMENTS



This symbol also means service and dependability. It stands for all the helpful transportation knowledge that North American Car has acquired through more than forty years of supplying specially designed tank cars to leading chemical shippers. It is a guarantee of safe, economical railroad shipping.

Do you now have products shipped in drums that have reached tank car capacity? Discuss this with us.

NORTH AMERICAN CAR CORPORATION

NORTH WESTERN REFRIGERATOR LINE COMPANY

A nation-wide organization with branch offices in important market centers

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How to INCREASE BOILER RATINGS with your present furnace and stack

Coppus-Dennis FANMIX Burners Give You More Heat with No Other Major Change in Equipment

Coppus-Dennis **FANMIX** Burners give you *perfect* mechanical mixing of fuel and air *at the burner outlet . . . instantaneous* ignition close to the burner . . . and *complete* combustion *without visible flame* when burning natural gas. No other burner combines these three advantages.

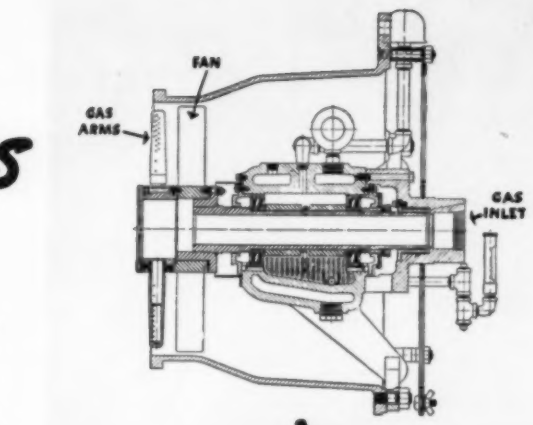
Because **FANMIX** delivers the *right* mixture of fuel and air *without blow-torch action*, all of your furnace space is used for combustion . . . *none for mixing*. That's why your present furnace can release more heat . . . why new installations can get more heat out of smaller furnace space.

Because **FANMIX** can be guaranteed to secure complete combustion of natural gas *with less than 5% excess air*, you get uniform "radiant heat" *without drifting hot spots*. That's why a **FANMIX**-fired furnace seldom varies in temperature more than 5% over its entire area.

WRITE FOR ALL THE FACTS

When you see in Bulletin 410–6 how fuel escaping from orifices in rotating driver arms rotates the fan to draw the correct proportion of air into the path of the fuel at right angles . . . how **FANMIX** creates its own forced draft, reduces stack requirements, prevents cracking of "wet" gas . . . how two **FANMIX** types handle either gas or oil or any combination of both — you'll understand why **FANMIX** Burners have such wide acceptance in oil refineries and power plants.

Send for the Coppus-Dennis **FANMIX** Bulletin 410–6. Coppus Engineering Corporation, Worcester 2, Mass. Sales Offices in THOMAS' REGISTER. Other Coppus "Blue Ribbon" products in BEST'S SAFETY DIRECTORY, CHEMICAL ENGINEERING CATALOG, and REFINERY CATALOG.



ANOTHER
COPPUS
"BLUE RIBBON" PRODUCT

COPPUS ENGINEERING CORP.
231 Park Ave., Worcester 2, Mass.

Please send Bulletin 410–6 to:

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Company .....

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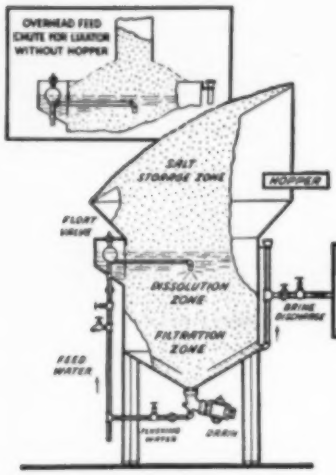
The LIXATE pipe line to efficient brine distribution



Brine delivered by pipe to every point of use in your plant.

THE LIXATOR *automatically* provides 100% saturated crystal-clear, self-filtered brine that can be piped, by gravity or pump, anywhere . . . at any distance . . . it is needed in your plant.

HOW THE LIXATOR WORKS

In the dissolution zone—Flowing through a bed of Sterling Rock Salt which is continuously replenished by gravity feed, water dissolves salt to form 100% saturated brine. In the filtration zone—through the use of the self-filtration principle originated by International, the saturated brine is thoroughly filtered through a bed of undissolved rock salt. The rock salt itself filters the brine. Nothing else is needed.

JUST TURN A VALVE for Lixate Brine that meets the most exacting standards for chemical and bacterial purity . . . that can be diluted volumetrically to any desired strength.

THE LIXATE PROCESS for Making Brine cuts production costs as high as 20% . . . by cutting labor, time and waste in making brine. No hauling, measuring, stirring . . . YET ALWAYS a continuous supply of *accurately measured* brine.

Consult our Technical Service Department on your use of salt and brine. The experienced men on this staff will advise you on the proper location for Lixator and salt storage, pumping arrangements, types of pumps, meters, and valves. They will fit the *money-saving* Lixator into your plant operations. Write today!

NOW AVAILABLE

The New Stainless Steel
STERLING MODEL LIXATOR
For "Lifetime" Use
For Greater Economy
For Added Cleanliness

The **LIXATE** *Process*
REG. U. S. PAT. OFF.
for making brine
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Scranton, Pa.

STAINLESS TUBING IS YOUR BEST BUY for highly CORROSIVE conditions

B&W makes ANY TYPE you need -- SEAMLESS & WELDED

ALL THESE . . . AND MORE

Croloy 18-8 Hi Carbon	(Type 302)
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Croloy 18-8 S	(Type 304)
Croloy 20-10	(Type 308)
Croloy 25-12	(Type 309S)
Croloy 25-12 Cb	(Type 309S Cb)
Croloy 25-20	(Type 310)
Croloy 16-13-3	(Type 316)
Croloy 16-13-3 Cb	(Type 316 Cb)
Croloy 18-13-3	(Type 317)
Croloy 18-8 Ti	(Type 321)
Croloy 12 Al	(Type 405)
Croloy 12	(Type 410)
Croloy 12-2	(Type 414)
Croloy 13	(Type 420)
Croloy 18	(Type 430)
Croloy 22	(Type 443)
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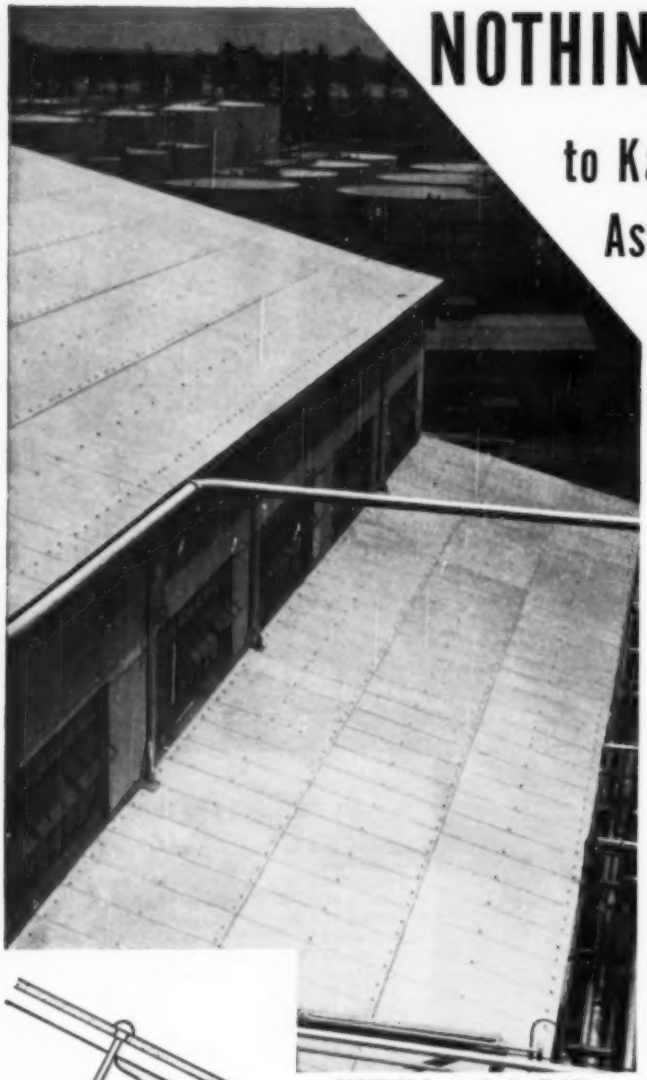
General Offices: Beaver Falls, Pa.

Plants: Alliance, Ohio, and Beaver Falls, Pa.

NOTHING HAPPENS

to K&M *"Century"* Asbestos Corrugated



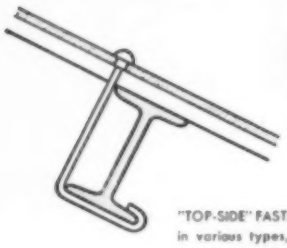
Here you see it used for both the roofing and siding on this Shell Oil Company building at Deer Park, Texas. Don't ever expect to see it hurt by the weather or other adverse atmospheric conditions. Count on it to go rustless and rotless. It won't suffer from rodents and termites, and is exceptionally resistant to fire.

Easily cut and fitted on the job, K&M "Century" Asbestos Corrugated produces tight, good-looking surfaces at minimum labor cost. For extra savings use "TOP-SIDE"* fasteners, as on this Shell building. They entirely eliminate scaffolding and are only available with K&M "Century" Asbestos Corrugated.

Your finished job will benefit by the inherent structural strength of this material which actually gains strength with age. As for upkeep, you needn't figure on even one bit of paint!

*T. H. & B. Enterprise Corp.

ERECTORS: Lummus Co., New York City.



"TOP-SIDE" FASTENERS are made in various types, to fit all steel members on both roofing and siding. Illustration of typical "J" type for roofing.

Nature made Asbestos...
Keasbey & Mattison has made it serve mankind since 1873

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WHICH IS YOUR NEED...

WATER PURIFICATION
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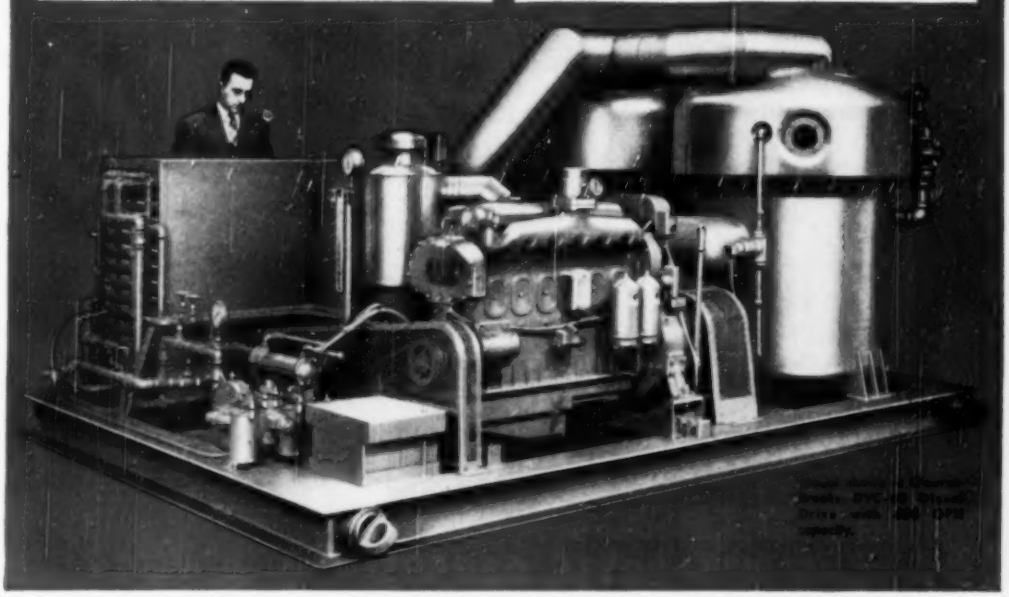
- **Concentration for Recovery**

Tanning Liquors
Brine
Amino Acids
Other solutions and substances
Penicillin Slurry
Industrial Chemicals
Black Liquor from Pulp-Paper Mills

- **Concentration for Disposal**

Brine
Penicillin
Other solutions and substances



CLEAVER-BROOKS COMPRESSION STILLS are highly efficient in two widely divergent but essential applications in chemical and processing industries:

Chemically pure, pyrogen free, distilled water, (so pure that it is used for intravenous or medical preparations) can be produced by Cleaver-Brooks Compression Stills. Pure water at a cost as low as 65 KWH per 1000 gallons, (equal economies with Diesel units).

CLEAVER-BROOKS COMPRESSION STILLS solve many concentration problems. They provide economical recovery of valuable solids which are normally lost in waste disposal. Cleaver-Brooks Stills have concentrated Tanning Liquors, Brine, Penicillin Slurry, Black Liquors from pulp mills and many other solutions.

Available in standard size units from 75 gph to 2100 gph, electric or Diesel drive. Larger sizes to fit specific applications can be constructed for field erection. Your water or concentration problem will be thoroughly studied by Cleaver-Brooks engineers and recommendations made for improving your plant production.

CLEAVER-BROOKS COMPANY
339 E. Keefe Avenue, Milwaukee 12, Wisconsin

For complete information on Cleaver-Brooks Distillation Units write on your letterhead to Dept. CDU.

Cleaver-Brooks

BUILDERS OF EQUIPMENT FOR THE GENERATION AND UTILIZATION OF HEAT

Detergency gets a "big boost"

with WYANDOTTE CARBOSE

Specialized grades of Sodium CMC

*Wyandotte Carbose** is a unique compound developed especially for detergent applications. When used in conjunction with both "built" and "unbuilt" detergent products, it boosts the cleaning ability of these products to a remarkable degree.

In the washing of cottons and other fabrics, with soils running from the lightest to the heaviest, formulations containing Wyandotte Carbose consistently provide more thorough soil removal and greater whiteness retention.

Carbose is also used in the production of improved water-base paints, textiles, paper and adhesives.

• This versatile compound is economically priced and is available in carload quantities. Write for complete data on its properties and applications.

* *Reg. U. S. Pat. Off.*

Wyandotte Chemicals Corporation

Wyandotte, Mich. • *Offices in Principal Cities*

SODA ASH • CAUSTIC SODA
BICARBONATE OF SODA
CALCIUM CARBONATE • CALCIUM CHLORIDE
CHLORINE • HYDROGEN • DRY ICE
SYNTHETIC DETERGENTS • GLYCOLS
CARBOSE (Sodium CMC) • ETHYLENE DICHLORIDE
PROPYLENE DICHLORIDE • CHLOROETHERS
AROMATIC SULFONIC ACID DERIVATIVES
OTHER ORGANIC AND INORGANIC CHEMICALS

Wyandotte
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Robins Hydrex Screen quickly removes fibrous impurities

Imagine a liquid so "tangled" with thick fibers that it plugs up purifying equipment *every fifteen minutes!*

Every quarter-hour, palm oil clarifiers of the United South Africa Company, Guttenberg, New Jersey, had to be shut down for cleaning. Production came to a standstill dozens of times a day. Costs soared.

Then a small Robins Hydrex Screen was installed. And a costly "stop and go" operation changed quickly to a profitable flow. Every hour the Robins Hydrex Screen removes troublesome fiber from almost 9,000 pounds of palm oil!

This is but one example of the many industrial processes that you can simplify and speed up with Robins Hydrex Screens. You'll find a type of meshes, sizes and designs to meet your particular needs . . . whether you have to:

1. Save liquids from solids.
2. Save solids from liquids.
3. Remove fines from coarser materials.

You can use them to screen materials that are hot or cold, acid or alkaline.

SEND TODAY for the story of how your screening problems can be solved with Robins Hydrex Screens. Address Robins Conveyors Division, 270 Passaic Avenue, Passaic, N. J.

ROBINS
HYDREX
SCREENS

HEWITT-ROBINS products for all your materials-handling needs!

Robins Conveyors Division; Screens, Idlers, Conveyors, Shakeouts. **Hewitt Rubber Division;** Industrial Hose, Conveyor Belt, Transmission Belt. **Robins Engineers;** Complete Bulk Materials-Handling Systems.

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NEW DEVELOPMENTS YOU'LL WANT TO SEE AT THE CHEM SHOW

BOOTHS
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See these, and other new developments by "U. S." engineers to help you process quicker, safer, better, and at lower cost.

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COMMENTS ON THE NEWS OF CHEMICAL ENGINEERING IN INDUSTRY

November 1949, Volume 56, Number 11

Acrolein by direct oxidation

Shell Development Co. has uncorked a new process for making acrolein. And out at Emeryville, Calif., Shell Chemical Corp. is producing acrolein in a pilot plant by this new process—the direct oxidation of propylene.

Until now, Shell Chemical had been making acrolein in a 20,000-lb.-a-month unit at Houston, Tex., by the thermal cracking of diallyl ether. But now the Houston plant has been shut down. For it is cheaper to produce acrolein by the new direct oxidation process, due to the low cost of propylene.

Shell Chemical has slashed the price of acrolein from $1 a lb. to 50c. a lb. Before the advent of the propylene oxidation process, acrolein had been hard to come by and high in price.

Acrolein is a major raw material in the production of synthetic methionine, a vital amino acid. Exciting possibilities abound for this versatile aldehyde in textiles, resins, plastics, coatings and drugs.

How does Shell Development's new process work? While Shell engineers are keeping mum, here is one shrewd guess: the olefin is contacted with oxygen or an oxygen-bearing gas in the presence of cuprous oxide or a supported cuprous oxide catalyst. In general, the process can be used to convert olefins with three or more carbon atoms to vinyl type aldehydes or ketones. It happens that Shell Development is also producing experimental quantities of methacrolein by this process.

Moreover, Shell Development is turning out in limited experimental quantities a raft of other acrolein derivatives. For acrolein, the new propylene oxidation process is opening new vistas.

Lining equipment with Teflon

Teflon lining for equipment, capable of withstanding practically all chemicals up to 500 deg. F. and competitive with glass and rubber linings, will come gradually into use within the next few years (see *Chementator*, March 1949, p. 78).

Du Pont has found a way to polymerize tetrafluoroethylene and get a colloidal suspensoid. It is the extremely fine particle size of the suspensoid that turns the trick. From the Teflon suspensoid by further processing Du Pont produces spray coatings that will adhere to steel. Each coat is baked at about 750 deg. F. to fuse the particles into a continuous film.

Right now, Teflon spray coatings cost $65 to $85 a gal., and one gallon covers about 300 sq. ft. with a single 1-mil coat. All told, cost of materials for a four-coat lining would come to about 90c. a sq. ft. And application costs might add another $1.

Until the new plant now going up at Parkersburg, W. Va., starts producing in July 1950, Du Pont can spare only limited quantities of the Teflon coatings for development work. (For the full story of this and other exciting Teflon developments, see p. 120.)

Schering on the block

Justice Department is getting ready to sell Schering Corp., an alien property with book value of $6 million and total assets of $9.5 million, within 90 or even 60 days. Sale will be by public offering of Schering's stock, now held by the Office of Alien Property.

Way was paved for the sale when the suit brought by Swiss Bank Corp., which claimed to be the rightful and non-enemy owner, in the Southern District Court of New York was settled out of court for about $500,000.

OAP had hoped to have a prospectus out by now, but ran into snags over patents held by Schering. These are German hormone patents.

Normal government policy is to free seized patents for widest possible competitive use in this country. But to do this with the Schering patents would destroy the company's value. So the government is trying to work out a patent-sharing plan on a reasonable royalty basis before offering Schering for sale.

First pulp mill for Alaska

Construction of Alaska's first pulp mill is slated to get under way next spring. At Ward's Cove near Ketchikan a $30 million mill is going up to turn out pulp high in alpha cellulose. Initially, it will have a capacity of 300 tons, but this will later be upped to 500 tons.

The mill is being built by Ketchikan Pulp & Paper Co. This outfit is jointly owned by Puget Sound Pulp & Timber Co., long interested in tapping

(*Continued on page 70*)

MOTORS

KETTLES

applications ANACONDA (1) safety (2) efficiency and

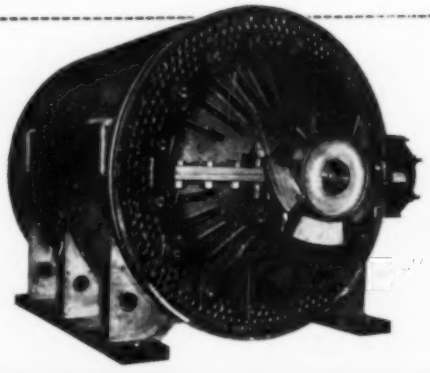
These three markedly different types of equipment testify to the versatility of copper and copper alloys. They also illustrate why you can't take many steps in a chemical processing plant without running into something made of copper.

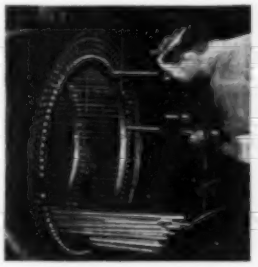
Of prime interest to users and fabricators of diverse equipment is the combination of desirable properties obtainable in the copper-alloy group. Using one or another of these metals you can get the following advantages in varying degrees:

High resistance to corrosion
High mechanical strength
Rapid, uniform heat transfer
High resistance to fatigue
High electrical conductivity
Less liability to sparking
Ready workability
Excellent welding properties

Perhaps ANACONDA Metals can raise the efficiency of your equipment, cut its maintenance costs, or even make it "safer."

For general information or technical counsel on any form of copper or type of copper alloy, or any problem related to their use in your business, write to The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Limited, New Toronto, Ont.

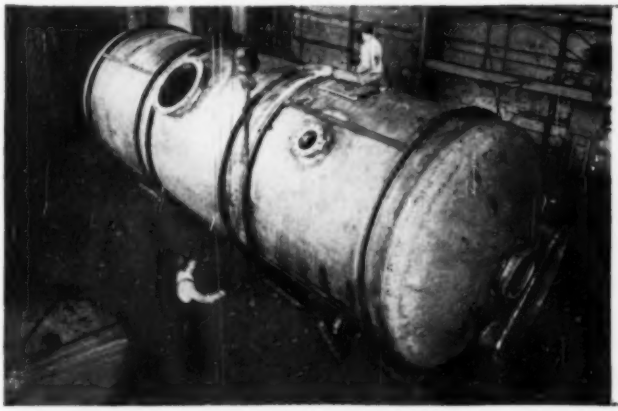




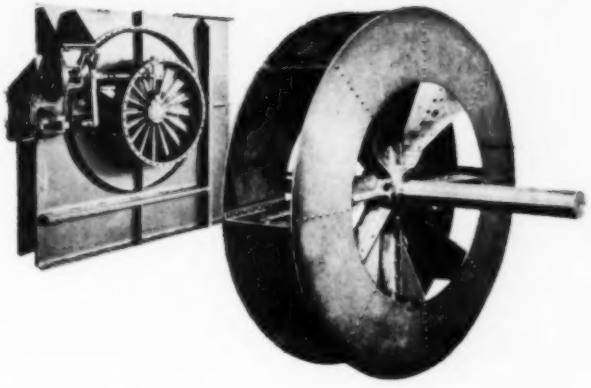
400 HP. EXPLOSION-PROOF TUBE-COOLED MOTOR built by Allis-Chalmers Manufacturing Company. This unusual motor has attracted much interest in the process industries. An important feature is its use of ANACONDA Copper Tubes for rapid heat transfer in the motor cooling system. Room air, driven by an external fan on one end of the rotor shaft, is forced through the cooling tubes shown installed in the stator yoke. Air, sealed within the motor, is circulated around the outside surfaces of the copper tubes, and the internal heat is thus safely dissipated.

For copper and its alloys

FANS • In widely different Copper Alloys promote (3) long equipment life!



COPPER ESTERIFICATION KETTLE, 129" x 29', fabricated by The Vulcan Copper & Supply Company, Cincinnati, Ohio. Shell, head and nozzles are 3/8" thick ANACONDA Deoxidized Copper; heating element "U"-tubes are ANACONDA Copper; tube sheet is 1" thick Everdur*. All seams and joints are brazed with silver solder.



60" TYPE PB BLOWER HOUSING AND WHEEL built by American Blower Corporation, Detroit, Michigan, for use on a solvent recovery process. Wheel rims, blades and rivets, as well as inlet vane control blades, are Everdur. Hub casting is manganese bronze. In addition to great strength and high resistance to corrosion, use of Everdur in this application has the important added advantage of reducing sparking hazard.

...consult ANACONDA

*Reg. U. S. Pat. Off.

Alaska's pulp resources, and American Viscose, a big user of rayon-grade pulp.

Ketchikan Pulp & Paper has a 50-year contract with the U. S. Forest Service that starts in 1952. By that time the 1.5 billion cubic feet of standing timber in southeastern Alaska's Tongass National Forest on which it bid successfully about a year ago will have grown into 8 billion cubic feet.

If the U. S. can find takers for six other stands in Alaska, it will be a big step toward U. S. independence in pulp stock. For even now this country depends on Scandinavia for much of its pulp stock.

Mammoth refinery for Anglo-American

Foster Wheeler is at work on Europe's biggest oil refinery at Fawley, England. The $150 million refinery, being built for Jersey Standard's British affiliate, Anglo-American, is slated for completion in about three years. Its capacity: 110,000 bbl. a day.

Nine processing units, as well as a complete steam plant, are being designed and constructed for Anglo-American by Foster Wheeler.

Donora smog report

The pall that settled over Donora, Pa., in October 1948 brought on the deaths of some 20 persons. The six-month survey of air pollution at Donora, just completed by the U. S. Public Health Service, will trigger off a long burst of consequences. Its impact will be felt in smoke-bedevilled industrial communities across the country.

Although the 25 government troubleshooters who made the study—first of its kind in the world—were not able to put the finger on any particular contaminant as the cause of the disaster, they did learn some significant things.

Some 42 percent of Donora's 14,000 population were affected; 10 percent, severely affected.

Pre-existing disease of the heart and lungs was the single significant factor among those who died.

Sulphur dioxide and sulphur trioxide from coal smoke were considered the most likely culprits, more so than other chemical gases found in the air over Donora.

Smoke from domestic stoves and furnaces, steamboats, and railroads are important contributors to pollution, as well as smoke from industrial plants.

There was a relationship between poor housing and illness suffered from smog.

What are some of the reactions to the report?

The Public Health Service will get money to make continuing studies of air pollution. This agency would like to set up a whole series of test cities to find out the relationship between air pollution and health.

City and state governments are going to be asked to write local ordinances that will provide for reducing plant operations when smoke and smog conditions might become dangerous. Donora is already taking such steps, as recommended by the PHS experts.

There will be a drive for more adequate housing in industrial towns, plus a demand for (1) smoke-abatement equipment in plants and (2) air-filtering and air-conditioning equipment for homes in smoke-polluted towns.

The CIO Steelworkers, the union of the Donora workers, is already plugging for management action to cut down air pollution. Other unions are going to follow suit.

A tipoff for other communities: the PHS survey discloses that the death rate in Pittsburgh is higher than in Donora, and that the death rate from pneumonia and influenza—diseases that might be complicated by air pollution—is also higher in Pittsburgh than in Donora.

Hearings on minimum wage

U. S. Department of Labor started hearings on November 16 to determine whether the minimum wage paid under the Walsh-Healey Public Contracts Act by manufacturers of chemicals and related products for work done on government contracts of more than $10,000 should be raised. Present rate, set in 1942, is 40c. an hr.

Last April, according to a survey made by the BLS, only 5 percent of the 120,000 workers covered earned less than $1 an hr., whereas 15 percent earned $1.80 or more. The survey covered 907 plants, each employing more than eight production workers, in 10 major branches of the chemical industry.

Total dollar volume of government contracts to which the Walsh-Healey Act applies that were let to makers of chemicals and related products between January 1947 and July 8, 1949, was almost $75 million.

South secedes from union

FROM THE CIO AWAY—A sudden move has just been made by C. W. Danenburg, southern vice president of the CIO Gas, Coke & Chemical Workers, headquartered at Atlanta, Ga., to break off the southern district of this union and to form a new independent union called the Southern Chemical Workers Union.

SECESSION—Rebellion flared when Danenburg called a secret meeting of representatives of all locals of the CIO Chemical Workers in the South, at which he proposed the idea of setting up a separate southern union, unaffiliated. In this, he was aided and abetted by his lieutenant, Harry L. Zebal, the union's district director in New Orleans. The alleged grievance: mismanagement of the union by northern carpetbaggers. Delegates at the conclave were to propose disaffiliation at their local meetings.

Two locals are supposed to have voted to dis-

(*Continued on page 72*)

From SHELL CHEMICAL

New Lower Price!

ACROLEIN

$$CH_2{=}CH{-}\overset{\displaystyle H}{\underset{|}{C}}{=}O$$

THE VERSATILE, EXTREMELY REACTIVE INTERMEDIATE

Because of its almost unlimited reaction possibilities, Acrolein is being used or is under consideration for a wide variety of products.

At the new, substantially reduced price, Acrolein is now an even more attractive intermediate . . . allowing economical exploration of its use for important new products.

Some of the products of the many possible Acrolein reactions are listed here. If you are working with any of these, we suggest that you investigate the advantages *and new economies* of Acrolein. We will be glad to discuss the use of Acrolein in your processes.

PROPERTIES

Molecular Weight	56.06
Specific Gravity 20/4°C.	0.8389
Melting Point	—86.9°C.
Boiling Point	52.7°C.
Flash Point, Tag Open Cup	Below 0°F.

Colorless . Soluble in alcohol and ether

REACTIONS OF THE CARBONYL GROUP

Reactant	Conditions of Reaction	Products of Reaction
KCN	Glacial acetic acid in ether solution	$CH_2{-}\underset{OH}{CH}{-}CH{-}CN$ acrolein cyanohydrin
Malonic acid	Pyridine solution	$CH_2{=}CH{-}CH{=}CH{-}COOH$ 2,4–pentadienoic acid
Acetic anhydride	In presence of acid	$CH_2{=}CH{-}CH(O{-}\overset{O}{\overset{\|}{C}}{-}CH_3){-}O{-}\overset{O}{\overset{\|}{C}}{-}CH_3$ acrolein diacetate
C_2H_5MgBr	Grignard solution	$CH_2{=}CH{-}\underset{OH}{CH}{-}C_2H_5$ 1–penten–3–ol
HCl (dry)	Low temperature	$Cl{-}CH_2{-}CH_2{-}CHO$ β–chloropropionaldehyde

REACTIONS OF THE DOUBLE BOND

Furan	Presence of SO_2 and high temperature	2–furanpropionaldehyde and 2,5–furandipropionaldehyde
Cyclopentadiene	Elevated temperatures	2,5–endomethylene–1,2,3,6–tetrahydrobenzaldehyde
RSH	—	$R{-}S{-}CH_2{-}CH_2{-}CHO$ β–alkylthiopropionaldehyde
Phenol	In presence of acid or dilute alkali	aldehyde type resins

SHELL CHEMICAL CORPORATION

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affiliate: a 1,900-member local at Celotex Corp. in Marrero, La., near New Orleans, and a 500-member local at another plant in the same community.

HERE COME THE YANKS—President Martin Wagner of the CIO Chemical Workers, who once spearheaded the anti-Communist drive in his union, together with the other vice president, Joseph Joy, and the union's secretary-treasurer, Cecil Martin, rushed south to stem this rebellion. These men have hopes that the disaffiliating locals will reconsider and stick with the CIO.

While President Wagner went straight to New Orleans to be on hand for a meeting of the two bolting locals, Martin, the national secretary-treasurer, met with the executive board of big Local 288 at Oak Ridge. In the gaseous diffusion plant at Oak Ridge, run by Carbide & Carbon, the union has 2,000 members. The atomic energy workers have fought over the split, but without a decision on disaffiliation.

Similarly, a motion to follow Danenburg out of the CIO was tabled by the big local at Mascot, Tenn.

STAKE—The CIO Chemical Workers stands to lose about 20,000 members if the southern district splits off.

SIGNIFICANCE—What is behind this civil war within the CIO? Is it an attempt by craggy John L. Lewis to take over the chemical workers? Or is it a clash of personal ambitions that has nothing to do with the left-wing fight now raging in the CIO?

STERNER STUFF—The crotchety Danenburg, who has always sought bigger assignments and who has never been satisfied with what he got, may have been nursing a private grudge. Being from the South, he was given the southern territory in an effort to pacify him. President Wagner feels that Danenburg probably wanted to be president of the union.

RAID BY LEWIS—A veteran CIO leader in Memphis characterizes the movement as "an attempt of John L. Lewis to raid the CIO." And W. A. Copeland, in charge of the union's work in Tennessee, sees in it an attempt by Danenburg to lead the chemical workers into John L. Lewis' District 50 via a devious route, by first setting up an independent union and later bringing this entire union into District 50. Danenburg, points out Copeland, once worked for Lewis.

Fabulous trona gusher in Wyoming

Almost pure trona, in 5 percent solution, is coming from a gusher in southwestern Wyoming at the unprecedented rate of 10,000 bbl. a day. What is more, the concentration is increasing as the gusher flows. Already, a second well has been brought in.

This is the first such high-grade trona gusher ever found in the U. S., according to Bureau of Mines men on the scene. Only three similar deposits, not gushers, have been reported in the world. One is Lake Nagadi in East Africa, which covers 30 sq. mi. and is estimated to contain 200 million tons of trona. Another is Lake Loona in the province of Nizam in India, while the third is a deposit in Venezuela. These three deposits contain high-grade trona with only traces of impurities in solution.

The Wyoming gusher was struck in the McDermott Basin, 34 mi. north of Rock Springs. It is on land that is in the public domain. Wyoming's Senator Joseph C. O'Mahoney helped get the prospecting permits. Lucky holder of the property rights to this trona gusher on government land is W. O. McDermott of Sherman Oaks, Calif.

Westvaco has drilling rights nearby on government land and land belonging to the Union Pacific. But so far Westvaco has not had much luck.

Peculiarity of this formation is that the liquid coming from it contains only traces of chlorides, sulphates, borates, magnesium and calcium. Approximate composition of the solids: 5 parts of sodium carbonate to 2 parts of sodium bicarbonate.

An acidic hydrocarbon, now under study, is also present in small quantity. But it is easily separated, since it is soluble in the alkaline mother-liquors that remain after crystallization of the carbonate.

This might be a clue to the presence of a vast subterranean lake of trona solution kept under pressure by gas, possibly a mixture of natural gas and carbon dioxide. Samples taken from another drilling have given such an indication.

After a heavy bed of shale had been drilled through, the gusher was reached at 467 ft. Trona started to flow instantly, but no gas was let off from a pocket. The high-pressure gas pocket apparently is at some distance on a higher level.

So far, it looks as though the only recovery treatment needed will be: concentration, crystallization, whizzing, drying and bagging.

McDermott is expected to make a deal with a chemical company. He has been dickering with American Potash & Chemical. Also, Westvaco might possibly strike a deal with him.

Last year, nearly 4.5 million short tons of soda ash were produced in the U. S. This year the production will be somewhat smaller, about 4 million short tons.

Plant and equipment spending slides

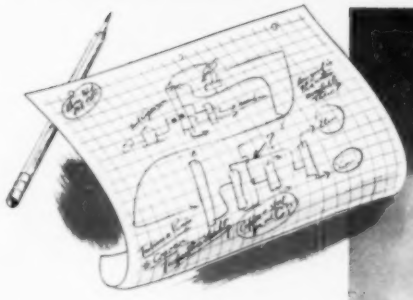
Industrial spending for plant and equipment during the last half of this year is running at a rate that will make 1949 the second biggest year in U. S. history.

Trend indicated by the latest figures from the Department of Commerce and the Securities & Exchange Commission, however, is not too reassuring.

Reason: it now looks certain that total capital expenditures for 1949 will come to $17.9 billion. This

(Continued on page 74)

from doodle to finished plant



Whether you're planning to use a process still in the laboratory or one proved by years of commercial operation, Badger will develop with you its optimum application to your specific needs.

Badger's broad experience may thus be available during the planning and design stages of the project, and the responsibility for all phases of engineering, procurement of materials and erecting the plant are confined to one organization.

Badger believes that best results can be obtained by placing the responsibility for a process plant in one experienced organization and working in close cooperation and confidence with that organization . . . from the first "doodle" to the completion of the plant.

E. B. BADGER & SONS CO. Est. 1841

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A SUBSIDIARY OF STONE & WEBSTER, INC.

PROCESS ENGINEERS and CONSTRUCTORS for the CHEMICAL, PETROLEUM and PETRO-CHEMICAL INDUSTRIES

is off 7 percent from last year's record-breaking $19.2 billion. Earlier surveys had indicated only about a 4 percent cutback.

There is a bright side to this, though. For one thing, the cost of plant and equipment expenditures is sliding off. Materials cost less, and even labor costs less with the elimination of overtime and time lost waiting for materials.

For another thing, the fall pick-up in business may cause executives to change their minds and spend more. The figures were gathered when many were pessimistic about the outlook. There is support for this in the figures revealing that manufacturers, hardest hit by the "recession," are the ones who were cutting back most.

Dow to build at Ironton?

Dow will purchase 250 acres of land along the Ohio River near Ironton, Ohio (see *Chementator*, May 1949, p. 72). The company's board of directors has just authorized the purchase.

No plant will go up at Ironton immediately. And whatever plans Dow officials have up their sleeves, they just are not talking. All they will admit is that Dow might put up a chemical plant there someday.

Dow took options on the tract about a year and a half ago.

Rayon plants remodeled

Beaunit Mills has completed installation of $6 million worth of new equipment at the Elizabethton, Tenn., rayon plant formerly owned by American Bemberg. And at the nearby plant once owned by North American Rayon a $2 million equipment remodeling job is under way. Beaunit acquired control of the two rayon companies from the Office of Alien Property (see *Chementator*, Jan. 1949, p. 70).

Duet for Diamond and Reichhold

Are two heads better than one? Apparently executives of Diamond Alkali and Reichhold Chemicals think so. For Diamond and Reichhold are teaming up to exploit the possibilities of phenol and its derivatives.

In a joint venture, the two companies will now form a new Alabama corporation to take over Reichhold's $3.5 million phenol plant at Tuscaloosa, Ala., and operate it.

Built by Reichhold in 1943 to help lick the wartime phenol shortage, the plant utilizes the sulphonation process. Now Diamond will put up money to streamline the process. In return, Diamond gets an option on a half interest in the new corporation.

Research facilities of Diamond and Reichhold will be combined to promote developments and new processes for phenol and its derivatives.

Reichhold, big gun in synthetic resins, chemical colors and phenolic plastics, uses phenol in its processes; Diamond produces alkalis and other basic chemicals used in making both phenol and chemical colors. This joint move strengthens Reichhold's hand. And it puts Diamond smack into the organics business.

Sweet profits from sour gases

DEAL—Mathieson Chemical Corp. has struck a deal with Fluor Corp., Ltd., of California, whereby the latter gets from Mathieson sole rights to put up sulphur recovery plants in the U. S. and Canada. The plants will employ Mathieson's processes to recover sulphur from such refinery waste products as acid sludge and hydrogen sulphide.

HYDROGEN SULPHIDE PROCESS—In one process, the gas mixture obtained from the purification of refinery gas or of natural gas passes through a combustion furnace where the hydrogen sulphide is converted to sulphur and water. These vapors are then passed through catalytic converters to increase the yield of sulphur vapor. Finally, they go through a scrubbing tower in which the sulphur is condensed.

Stack gases are substantially free of hydrogen sulphide; they contain less than 1 percent of sulphur dioxide. The sulphur produced is free of organic matter and arsenic and has a low ash content, its purity being 99.97 percent.

ACID SLUDGE PROCESS—In a second process, acid sludge remaining from the treatment of petroleum with sulphuric acid or alkylation acid, by-product from the alkylation method of producing high-octane gasoline, may be used. The acid material is fed into a vertical kiln containing a bed of glowing coke. It is decomposed to yield sulphur dioxide and coke, together with other gases. The coke formed from sludge is deposited on the coke bed, where some of it is used as fuel, and the other products are removed.

The sulphur dioxide is purified. Then it is reduced to sulphur through the use of hydrogen sulphide or other gases or incandescent coke. Gases from the reducer pass through a scrubbing tower. The gases pass upward countercurrent to a stream of liquid sulphur that condenses the sulphur vapor in the gas mixture.

SIDELIGHTS—Where both acid sludge and hydrogen sulphide are available at the same refinery, the hydrogen sulphide may be utilized in the acid sludge process. Flexibility is a feature of the process: variations in feed and in the ratio of sulphur dioxide to hydrogen sulphide in the raw materials do not affect recovery.

When it acquired Southern Acid & Sulphur Co. last March, Mathieson got into the sulphur and sulphuric acid business in a big way. Two plants of Southern Acid & Sulphur in Arkansas, one at McKamie and the other at Macedonia, have for many years been recovering sulphur from sour natural gas.

—*End*

BJ Submersible Pump

Why the motor at the bottom of the well?

The only basic improvement in deepwell turbine design . . . since Byron Jackson introduced the deepwell turbine pump in 1901.

SHAFTING LENGTH TROUBLES define the "borderline" beyond which the shaft-type deepwell turbine pump cannot be used successfully. That "borderline" is determined by length of shaft alignment.

THE SUBMERSIBLE IS DIFFERENT. Consisting of close-coupled deepwell turbine pump and electric motor, it operates deep down in the well . . . *entirely submerged in water* at *any* depth. With no long shaft or shaft-bearings to align, it operates equally well 50 feet down or 1500 feet down. Many are operating at depths from 900 to 1000 feet with amazing efficiency and unvarying dependability. And all because a successful means of sealing an electric motor for underwater operation was developed.

Get this new Submersible Bulletin. Write Dept. 129, Byron Jackson Co., P. O. Box 2017, Terminal Annex, Los Angeles 54, California.

Byron Jackson Co.

LOS ANGELES 54, CALIFORNIA

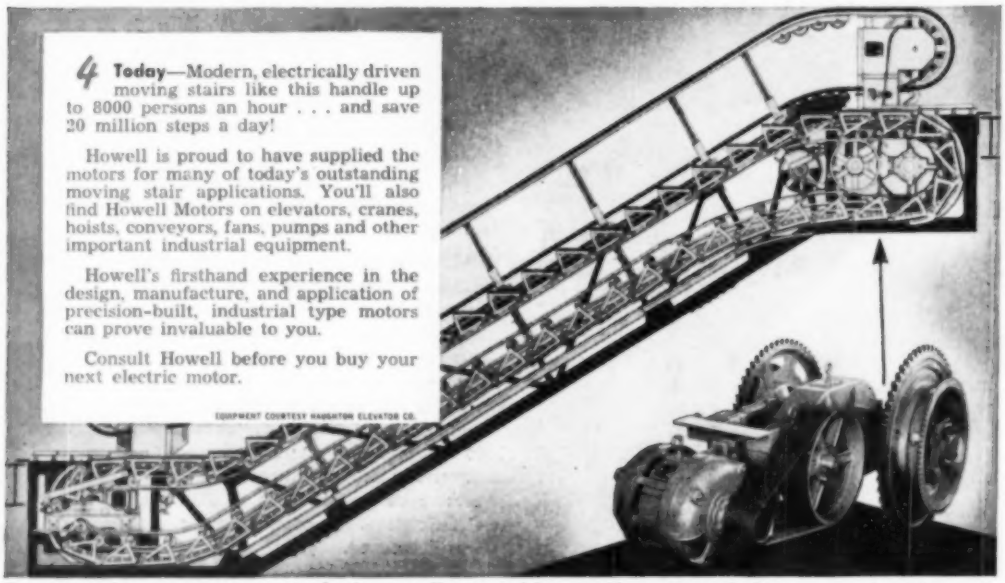
Offices in Principal Cities

1 **1800**—For centuries, steps were man's main means of going up. First came the ladder; later, crude steps formed stairways. Even so, man still had to ascend a step at a time under his own power.

2 **1875**—Stairways took all forms—straight, spiral, plain and ornate. Then, one Samuel Gray patented an "elevator and moving stairway." Though impractical, his idea set others to work.

3 **1901**—The forerunner of today's moving stairs was installed in a New York store. By 1915, Howell "Red Band" Electric Motors arrived. Soon, these rugged motors were widely applied.

SAVED...20 MILLION STEPS A DAY!



4 **Today**—Modern, electrically driven moving stairs like this handle up to 8000 persons an hour . . . and save 20 million steps a day!

Howell is proud to have supplied the motors for many of today's outstanding moving stair applications. You'll also find Howell Motors on elevators, cranes, hoists, conveyors, fans, pumps and other important industrial equipment.

Howell's firsthand experience in the design, manufacture, and application of precision-built, industrial type motors can prove invaluable to you.

Consult Howell before you buy your next electric motor.

EQUIPMENT COURTESY RADIATOR ELEVATOR CO.

Free enterprise encourages mass production, supplies more jobs—provides more goods for more people at less cost.

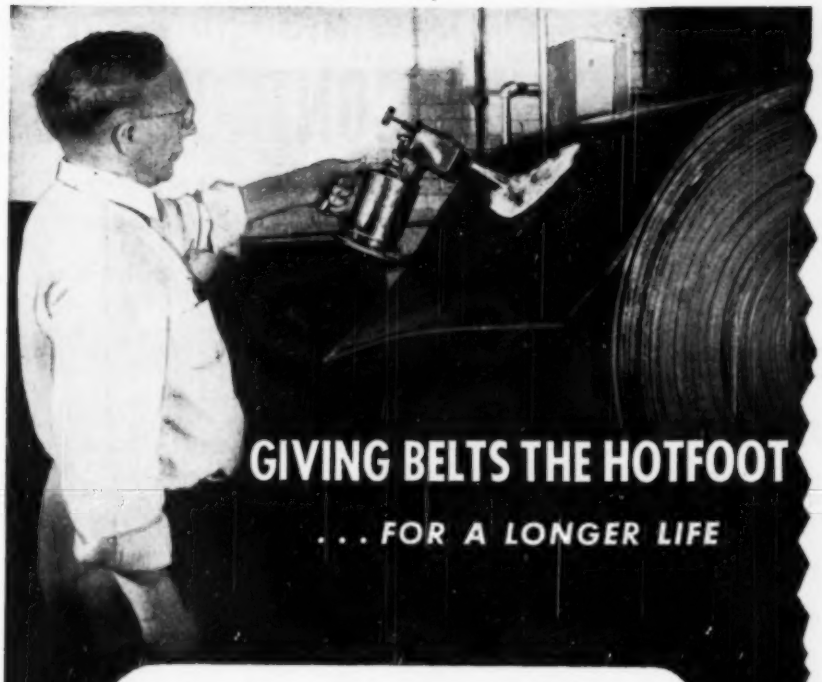
Elevator Type Motor

HOWELL MOTORS

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.

Precision-built Industrial Motors Since 1915

HOWELL Red Band MOTORS



GIVING BELTS THE HOTFOOT

. . . FOR A LONGER LIFE

QUAKER CONVEYOR BELTS PRE-TESTED 18 TIMES TO ASSURE LONG LIFE UNDER MOST SEVERE CONDITIONS

Chemicals . . . slag . . . ore—some hot, some cold and case histories prove Quaker Belts stand up under the most severe usage. They're pre-tested and torture-tested when they are made to withstand every operating condition.

One of the many tests Quaker Conveyor Belts must go through is shown above. A blowtorch, at high heat, held six inches from the surface of the belt for six minutes. Quaker Belts take it and are ready for more. They're tough, rugged and built for longer wear. They're made for the chemical industry to assure less maintenance . . . to save loss of labor in repairs . . . to help your plant reduce the "break-even point" in its operations.

Whatever your need for industrial products there's a Quaker Pre-tested Product for the Chemical Industry. Power transmission belting for every type of installation . . . rod and sheet packings . . . and moulded and braided hose. To economize . . . it pays to Quakerize your plant.

HOSE THAT STANDS WEAR

Hose for air, steam, water, oil, gas, chemicals, fire, or paint, Quaker makes it and makes it to fit the particular needs of the chemical industry . . . each length pre-tested for peak performance.

PACKINGS FOR TIGHTER SEALS

Quaker Packings are scientifically engineered for every use—for pumps, refrigeration, compressors, water lines, valves and many other places in the chemical industry. Each pre-tested for positive performance.

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LIFT YOUR PROCESSING TO A **NEW HIGH** IN ACCURACY

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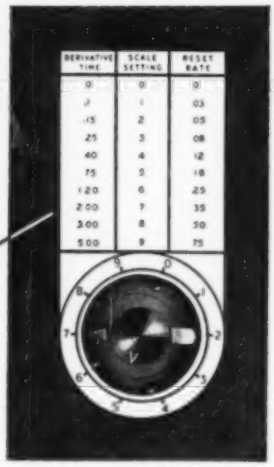
Here is a new automatic control instrument that will

★ ***repeat*** **a previously-established action exactly as it happened the first time every time you want it . . . or—**

★ ***duplicate exactly*** **the desired action in any like Bristol Series 500 Controller**



BRISTOL'S Series 500 Air-Operated Controllers for temperature, pressure, flow, liquid level

RESET, DERIVATIVE AND PROPORTIONAL TIME VALUES REPRODUCIBLE.

Adjustments are accurately calibrated and exactly reproducible. Similar settings in any Series 500 Controller will produce *exactly the same* values. This means you can replace controllers on a process with full assurance that such replacements will exactly duplicate the performance of the original. No more cut-and-try to arrive at the original setting . . . *saves hours by reducing shutdown time.*

These Features are NEW and EXCLUSIVE

SIMPLEST CONTROL SYSTEM TO SERVICE. Only one service adjustment is needed. The control units and parts making up the control system are so accurately designed and tolerances are so closely controlled that the system can be completely disassembled and reassembled, even with replacement parts, with only one simple adjustment needed to put the system in exact calibration. Almost anybody can service a Bristol Series 500 Controller.

FIVE TYPES OF CONTROL: on-and-off, proportional, proportional plus derivative, reset, reset plus derivative.

Investigate your new opportunity for accuracy and uniformity in automatic control. Write for new bulletin on Series 500 Air-Operated Controllers. THE BRISTOL COMPANY, 144 Bristol Road, Waterbury 91, Conn. (The Bristol Co. of Canada, Ltd., Toronto, Ont., Bristol's Instruments Co., Ltd., Lynch Lane, Weymouth, Dorset,

60 YEARS...1889-1949

BRISTOL

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

UNIBESTOS saves time, labor, initial and maintenance costs in application of pipe covering in high temperature installations

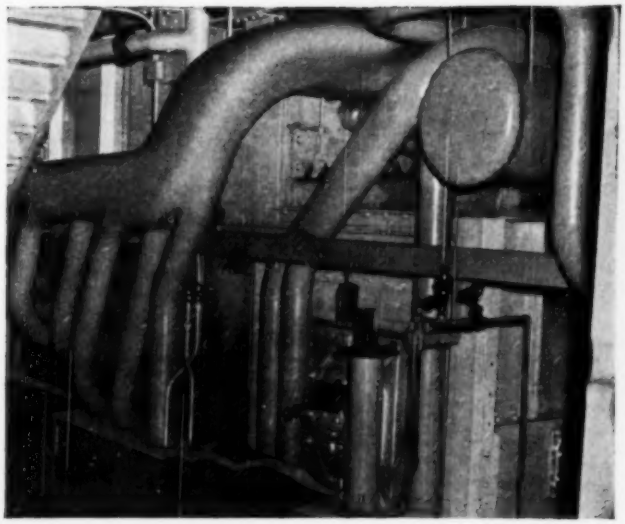


Photo Courtesy of The Dayton Power and Light Co., Dayton, Ohio. Insulation Contractor: C. W. Booher & Co., Dayton, Ohio.

UNIBESTOS

Pipe expansion in high temperature work, particularly where large pipe sizes are involved, often results in separation of insulation at joints throughout the length of the pipe. Application of UNIBESTOS sectional insulation in single-layer construction affords a control that has gained high favor with engineers and maintenance men everywhere. Because of the great strength of Unibestos, its inherent resiliency and the fact that it will not powder or crumble, sections can be readily stapled one to the other. Separation is thereby confined to one point which is easily covered by an expansion joint made from a spare piece of sectional UNIBESTOS.

With its high structural strength, resistance to moisture, vibration and deterioration, UNIBESTOS offers many advantages worthy of consideration. Write today for complete data . . . The coupon below, is for your convenience.

1 Unibestos' single-layer construction, is quickly applied. Ease of cutting, fitting, stripping, assures substantial savings in application costs.

2 Breakage, in transit or with ordinary handling care on the job, is non-existent . . . Real savings on any installation.

3 Unibestos affords additional savings because it is easy to remove and can be reapplied without loss of original efficiency.

UNIBESTOS No. 750 is suitable for temperatures up to 750° F. No. 1200 or Combination are recommended for temperatures up to 1200° F. These temperature ranges permit the use of one material at maximum efficiency for a wide variety of purposes.

Unibestos is available in half-sections up to 30" pipe diameter, in quadrants up to 60" diameter, and in cylindrical form where specified. UNIBESTOS No. 750, No. 1200, and Combination are all furnished in single-layer construction.

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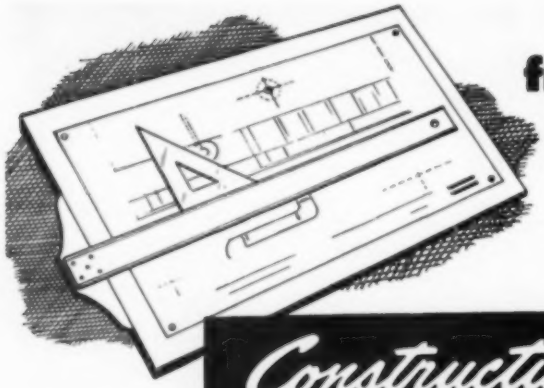
Gentlemen:
Please send sample ☐ and/or illustrated folder ☐ showing sizes, prices, conductivity curves and technical information on UNIBESTOS to

Company.....

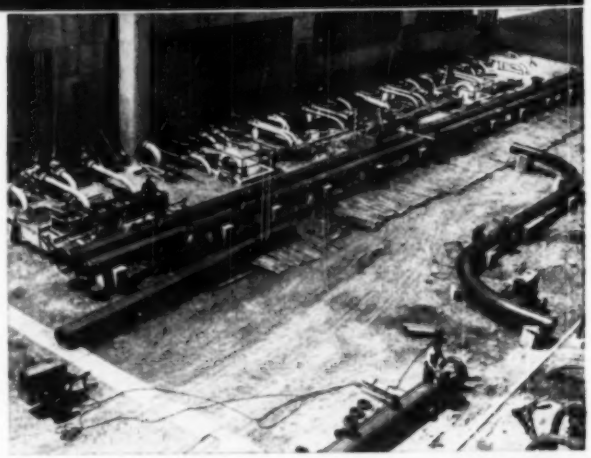
Address.....

Name..... Title.....



from drawing board to finished job . . .

Construction by GRAVER

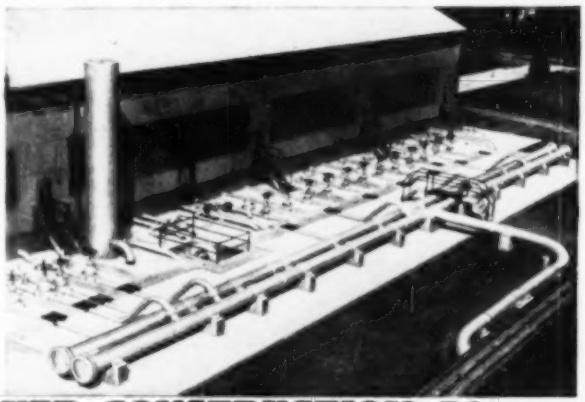


■ Graver Construction Service goes all the way to meet the requirements of the petroleum and process industries — from engineering and planning . . . through material procurement . . . to finished erection.

This complete service covers every step of practically any type or size of project — refinery units or complete refineries . . . piping . . . process equipment dismantled and re-erected . . . pipe line terminals . . . pipe line pumping stations . . . chemical plants . . . recovery plants . . . auxiliary equipment for synthetic rubber plants . . . auxiliaries to all types of refinery equipment.

Experienced personnel and full equipment are maintained at strategic locations for jobs involving foundations . . . structural steel . . . erection of heavy vessels . . . piping . . . brick work . . . painting . . . machinery setting . . . instrument boards . . . and electrical work.

No matter what your requirements may be — maintainance and repair . . . expansion or modernization of existing equipment . . . installation of new facilities — get in touch with the nearest Graver office *at once.*



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A DIVISION OF GRAVER TANK & MFG. CO. INC. EAST CHICAGO, IND.

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BOSTON WOVEN HOSE & RUBBER CO.
CONCORD
BWH
1. NEW oil, grease and sun-resistant cover. Long wearing, tough, abrasion resistant.
2. Asbestos braid insures maximum cover adhesion, includes new type static-conducting wire.
3. High-tensile steel wire for strength and safety.
4. Heat & oil-resistant tube.

NEW BWH COVER DEFIES "RUBBER EATERS"

RESISTS OIL, GREASE, SUN AND ABRASION DAMAGE

Oil, grease, strong sunlight and abrasion are factors that can't be controlled in many industrial operations. Yet they are all "rubber eaters" that tend to break down covers on steam hose and to shorten its service.

BWH technologists sweated over the problem for many laboratory hours before they developed this new, die-hard, synthetic rubber cover for Concord #10 Steam Hose. This improved cover adds so much to steam hose life, nobody with an eye to operating expenses can afford to overlook it. Yet it costs no more than ordinary hose!

Here's what makes Concord #10 a good choice for hard jobs:

1. It has the same dependably strong heat- and oil-resistant tube that won fame for extra service in BWH Bull Dog Steam Hose.
2. It is fortified with braids of high-tensile steel wire which are heat and pressure resistant. Gives strength with extreme flexibility.
3. Asbestos braid assures perfect cover adhesion, includes new type static-conducting wire.
4. NEW cover is unharmed over longer periods by oil, grease and sunlight—resists abrasion and highest steam temperatures.

When you need EXTRA safe hose that prevents "burst" explosions, withstands working pressure to 200 lbs. and gives you more for your money, investigate Concord #10 with new abuse-resistant cover!

HAVE YOU A JOB WHERE STAMINA COUNTS?

Bring us your toughest problems... we're specialists in solving them. Consult your nearby BWH distributor or write us.

Another Quality Product of

BOSTON WOVEN HOSE & RUBBER COMPANY

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Let us help you solve production problems in coating, lamination, cementing, sealing, saturating or related processes.

Take a good look at the Flintkote line. Chances are a standard Flintkote product or an available formula will fit your requirements.

Look over the various types . . . crude, synthetic and reclaimed rubbers . . . natural and synthetic resins . . . asphalt emulsions and cutbacks.

They're available in many forms . . . water dispersion types (non-inflammable) . . . solvent solution types . . . hot melt types and latex compounds. For roll coating, trowel, brush or spray application.

Do you work with metals, fiber, ceramics, paper, textiles? Do you want a product for end use . . . or for formulating and resale?

Whatever your requirements, you may save important time and money with a Flintkote product . . . either standard, or one we've made up just for you.

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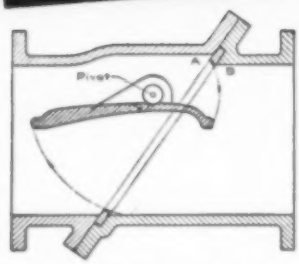
FLINTKOTE
Products for Industry

THERE IS *No Slamming* WITH CHAPMAN TILTING DISC CHECK VALVES



Cross-section of the Chapman Tilting Disc Check Valve illustrating the way that the balanced disc is supported on the pivot, with arrows showing the travel of the disc. A feature of the design is that the disc seat lifts away from the body seat when opening, and drops into contact when closing, with no sliding or wearing of the seats.

BECAUSE of the design of the balanced hinge-pinned disc, Chapman Tilting Disc Check Valves always close smoothly and quietly. There is no slamming, no hammering, no destructive pipe-line stress.

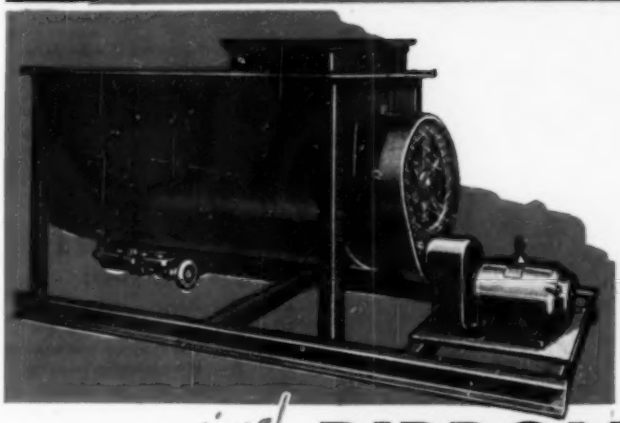
When open, the disc rides smoothly in the flow. As it closes, the effect of the stream on the short flap cushions the contact with the body seat. There is no sliding action and therefore wear on seats is reduced to a minimum. In addition, head losses are lowered as much as 65% to 80% over those experienced with conventional type check valves.

Available in either iron or steel.

The Chapman Valve Mfg. Co.
INDIAN ORCHARD, MASS.

LOOK TO International

FOR THE LATEST IN ENGINEERING DESIGN



The engineering skill and careful production methods used in building INTERNATIONAL RIBBON MIXERS guarantee their quality and dependability — their reputation for top performance in practically every type of process production is the best possible recommendation.

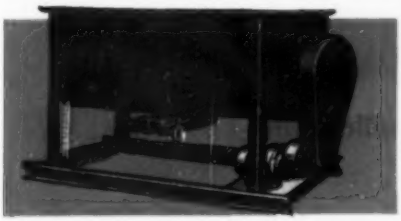
No matter what type or size of Mixer your work requires, there's an INTERNATIONAL made to exactly fit your needs. Our Engineering Department will gladly cooperate in solving any difficulty or unusual production problem.

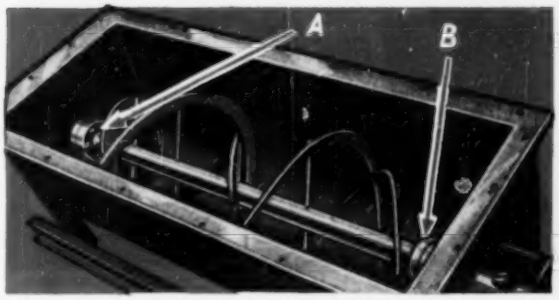
International RIBBON MIXERS

SUPERIOR in Design and Performance

Here are some of the reasons INTERNATIONAL RIBBON MIXERS give Longer and more Dependable Service—

- Proper Design relation of Outer to Inner Spiral Conveyors.
- Easy Maintenance, as entire Agitator can quickly be lifted from tub.
- Heavy all-welded construction.





Note how Agitator Spirals can easily be taken out.

By removing the bolts from the two companion flanges, A & B, above, the entire bolted shaft assembly containing the two spirals can be lifted from the Mixer tub. Therefore, no slotted end sections in the tub are required, which sections may tend to leak dust or liquid.

SEND FOR CATALOG 120B — showing various designs and applications, with specifications of INTERNATIONAL RIBBON MIXERS, and other Chemical Processing Equipment. Your Inquiry will receive our immediate and careful attention.

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INTERNATIONAL ENGINEERING, INC.

BALL MILLS, PORTABLE & PERMANENT MIXERS, BLENDERS, AGITATORS

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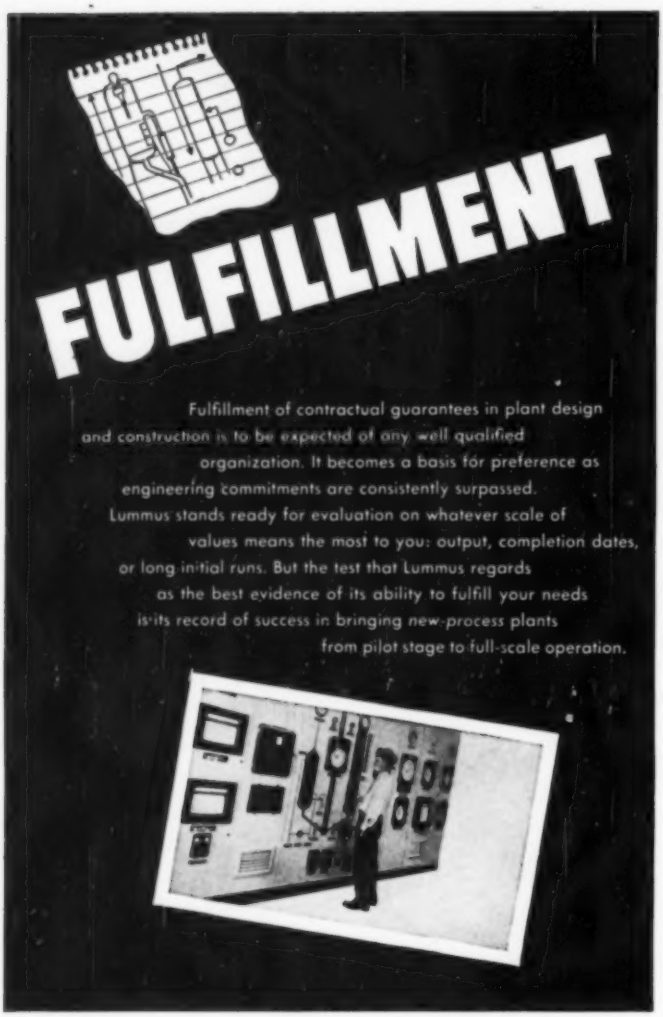
FULFILLMENT
Fulfillment of contractual guarantees in plant design and construction is to be expected of any well qualified organization. It becomes a basis for preference as engineering commitments are consistently surpassed. Lummus stands ready for evaluation on whatever scale of values means the most to you: output, completion dates, or long initial runs. But the test that Lummus regards as the best evidence of its ability to fulfill your needs is its record of success in bringing new-process plants from pilot stage to full-scale operation.

FULFILLMENT
(Phenol)

An important requirement in the design of a synthetic phenol plant for a large plastics manufacturer was low steam cost. Lummus engineers made remarkable improvements in an operation stripping phenol from brine, resulting in greatly increased steam economy.

FULFILLMENT
(Ethylene glycol)

A difficult combination of objectives: (1) exceptional purity of product and (2) unusual steam economy, was required at this plant. In an operation involving concentration of ethylene glycol with simultaneous removal of diethylene glycol, advanced process engineering by Lummus fulfilled its objective and made the entire project successful.

FULFILLMENT
(Ethylene)

One of the nation's important chemical producers engaged Lummus to furnish an advanced type of plant for high-purity ethylene. Service life of heaters used in cracking ethane and propane was a key consideration. Lummus heaters have accumulated more than several thousand hours continuous service, and are still "going strong." Overall success of this plant led to a new contract for a major ethylene plant.

THE LUMMUS COMPANY
420 Lexington Avenue, New York 17, N. Y.

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Esquina Las Gradillas, Caracas, Venezuela

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teamwork
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perspective
resourcefulness
technique

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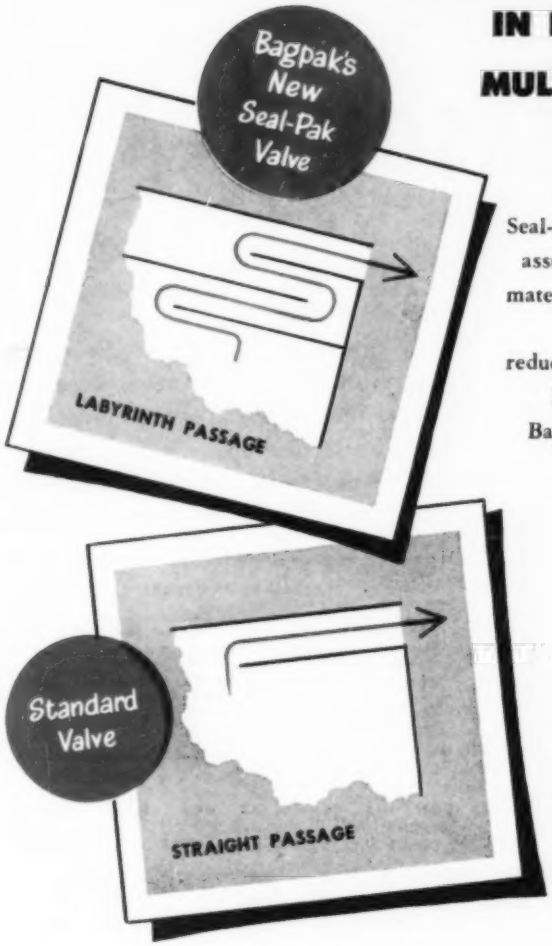

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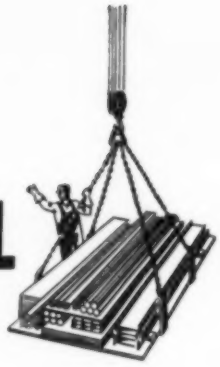

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ESTABLISHED 1902 SIDNEY D. KIRKPATRICK, Editor

Chemical Engineering

WITH CHEMICAL & METALLURGICAL ENGINEERING

NOVEMBER 1949

To Honor Achievement

On December 1 at an impressive dinner in the Waldorf-Astoria in New York, the chemical engineering profession will honor the postwar achievements of the Celanese Corp. of America. Theirs is an outstanding example of teamwork in pioneering a long-range program of chemical integration. The results of a dozen years of patient research have been boldly translated into plants and processes that are already contributing to the progress of the chemical, textile and plastics industries.

As sponsors of this Tenth Award for Chemical Engineering Achievement, it is our privilege to invite you and your associates to join us in making this the high spot of Chemical Week in New York.

Col. Bradley Dewey, president of Dewey and Almy Chemical Co., who as wartime rubber director of the United States, was intimately concerned with the butadiene program, will speak on "Integration for National Defense." President James R. Killian, Jr., of M.I.T. will tell why technical men are now being trained to enter all phases and functions of modern industry.

Grand-Daddy of Them All

In every field there is a leader. Usually he's the pioneer, who got there first with the vision and foresight to provide a useful, lasting service. We respect his confidence, enjoy his company, and give him our patronage. So it is that with many of us there is a peculiar attachment to the "Chem Show" in New York.

Way back in 1915—more than a generation ago—it pioneered the cause of chemical industry in America. It brought together for the first time those who urgently needed and those best qualified to supply chemical engineering materials, equipment and services. That has been the job of each of the predecessors of the 22nd Exposition of Chemical Industries, which will open the familiar doors of Grand Central Palace, in New York City, on Monday, November 28.

This year the theme will be new ways and means of cutting costs and increasing productivity. It is particularly timely now when there is so much pressure for lower prices in the face of rising unit costs for labor and materials. The only answer to such problems must be found in better processes and equipment.

The "Chem Show" provides an ideal place to talk your problems over with others who have faced and may have solved similar difficulties. From among the 350 or more informative exhibits you are bound to pick up many ideas and suggestions that will more than compensate you for your time and trip. It is an opportunity none of us can afford to miss. And, if you have time, drop in to see us at our old familiar stand—Booth 42.

A Good Index of Value

We quote from a recent official statement about the use of 2,4-D on arid range land: "Grazing profits from treated native range pastures have been twice as great as grazing profits from sagebrush-covered pastures during the past seven years of experimental grazing." Thus the ranchers and stockmen of the Southwest were given an impressive conclusion based on experimental results obtained on a third of a million acres of range land previously infested with sagebrush. And they were given a proper index of the value of the chemical, which costs only $2.25 per acre for material and labor.

Chemical industry is indeed fortunate when its customers are so presented with such a clear-cut story of the effectiveness of its products. Too often, as in the case of the DDT reports, misleading and conflicting conclusions merely compounded confusion.

Effective Public Education

Crawford H. Greenewalt, president of the Du Pont company, pulled no punches in a recent talk before the National Press Club in Washington. We wish that many of his fellow executives of chemical industry could have been present and heard his fear-

less and effective telling of the Du Pont philosophy of public service. Among many other important points having to do with the general subject of "bigness," Mr. Greenewalt presented three which are worthy of note here:

1. There is intense competition in chemical enterprise, not only because there are several makers of almost every chemical, but also because different chemicals compete with each other. Bigness does not in any way imply monopoly or freedom from competition.

2. A company becomes big, and becomes profitable, only because it furnishes wanted goods and renders a satisfactory service. Every Du Pont activity started small and grew big only because customers were pleased.

3. Any big firm creates business opportunities for many smaller companies. It often pioneers the production of newly developed products requiring heavy outlays of patient venture capital. Smaller companies supplying materials benefit although they could not of themselves provide this market. Also created are opportunities both for wholesale and retail firms that distribute the goods, and for hundreds of other small firms that use the big company's products as their starting raw material.

We wish that there could be more examples of this frank and aggressive presentation of the basic philosophy of chemical enterprise. Many important members of the press learned significant and interesting things from Mr. Greenewalt which they promptly reported to the general public. Even Congress may have benefited for we find the full text of the speech reprinted in the *Congressional Record* of September 29 (pp. A6243-5).

Victory for the "Learned Professions"?

Engineers have struggled long and hard for public recognition of their professional status. Practically all of our state legislatures have now enacted laws to provide licensing and registration. In most of our communities the engineer is held in respect comparable to that accorded members of the so-called "learned professions"—the doctors, lawyers and clergy. We have made slow but substantial progress.

It is very discouraging, therefore, to find that there are those in the Congress and the National Military Establishment who would rob the Engineer Corps of the Army of its long recognized professional status. On July 27, 1949, Congressman Carl Vinson of Georgia introduced H.R. 5794—a bill to provide for the reorganization of the Army and the Department of the Army and for other purposes. We are not so sure we know what all of the "other purposes" are but we note in Section 306(a) that there are to be certain so-called "basic branches" of the Army, to wit —Infantry, Armor, Artillery, Engineer Corps, Signal Corps, Adjutant General's Corps, Quartermaster Corps, Finance Corps, Ordnance Corps, Chemical Corps, Transportation Corps, and Military Police Corps. But, significantly we think, the same section would permit that "the President, the Secretary of Defense, or the Secretary of the Army may from time to time establish new basic branches and may discontinue or consolidate such basic branches as are now or may be established." That, presumably, is in the interest of promoting efficiency and if applied to the whole army, we would have no quarrel with it.

Reading farther, however, we find that paragraph (b) of the same section sets up three "special branches" of the Army—to wit, the Army Medical Service, the Judge Advocate General's Corps and the Chaplains. Then follows in great detail in sections 307, 308 and 309 specific authorization and instructions for maintaining a "hands-off" policy when it comes to upsetting the professional character of these special services and their officer personnel.

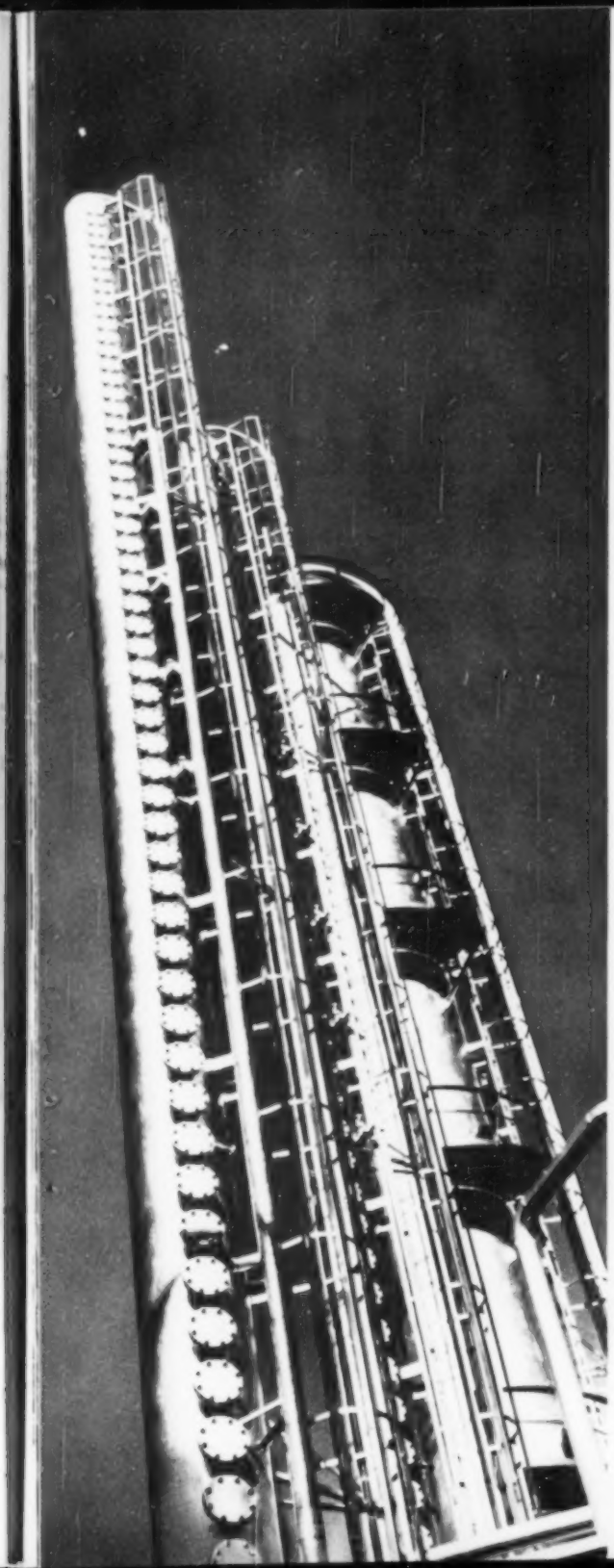
This proposed extension of executive authority is all the more surprising because it appears under the sponsorship of a veteran legislator who has steadfastly opposed similar policies of the present Secretary of Defense. We suspect that Chairman Vinson has been handed a package carefully prepared by some of the smarter planners in the Pentagon. We don't like to imply that the so-called "learned professions" had a hand in polishing off this particular package. But certainly that is no reason why technical men should sit by and see the Engineer, Chemical, Ordnance and Signal Corps robbed of their professional status.

Be Careful With Benzene

Plant and laboratory workers exposed frequently or for considerable periods to benzene and other aromatic compounds may often disregard the health hazard when initial symptoms are not very obvious. It is likely that many executives supervising laboratory or plant operations do not realize the serious consequences of such exposure and may not have taken all of the desirable precautions.

It appears that those who experience such exposure become more tolerant of the unpleasant vapors. It appears that some people actually grow to enjoy the aromatic vapors and thus unwittingly aggravate exposure through an unconscious pleasure they find in their exposure.

Few probably realize that the ultimate consequence of many aromatic vapor exposures is severe damage to the blood-forming organs, like the bone marrow, with a resulting incurable anemia. But long before this extreme consequence develops, the effects can be detected by suitable medical supervision. It is most important therefore, for supervisors to recognize this insidious hazard and make sure that there are no chances taken by any of their subordinates.



Integration and Achievement

TO INTEGRATE chemical engineering into the whole of a large and diversified industrial organization marks a notable achievement of our profession. It contributes to the onward march of our industry; it strengthens this nation's economy. And that is just what the great company we now honor has done. It has woven chemical engineering into the warp and woof of the tapestry that is its corporate structure.

This integration is officially recognized in bestowing the 1949 Award for Chemical Engineering Achievement upon the Celanese Corp. of America. Resourceful chemical engineers, backed by understanding and forward-looking executives, many of them experienced engineers themselves, have accomplished industrial miracles by applying the principles and processes of chemical engineering to the production of synthetic fibers, plastics and chemicals. Theirs has been voted the outstanding postwar program to reach commercial fruition during the current year. This is the decision of the distinguished Committee of

Award, a group of 55 senior engineering educators under the chairmanship of Professor-Emeritus Alfred Holmes White.

Do you seek dramatic evidence of how Celanese integrates chemical engineering into its living structure? Look to the great chemical industry abuilding in Texas, an industry that takes petroleum hydrocarbons and gets from them basic raw materials for textiles, plastics and chemical synthetics. Look to the new plants and research laboratories in seven other states—in New Jersey, Pennsylvania and Maryland, in Virginia, the Carolinas and Georgia. Look beyond our borders, to the south in Mexico and far to the north in British Columbia, where exciting projects are being pushed. But remember that bricks and mortar, towers and tank cars did not win this Award.

What really merits this Award runs deeply beneath the surface: the opportunities provided chemical engineers for teamwork and productive group effort, the encouragement given them to participate in all functions of the process industries, not only in research, engineering and production, but in management, administration and sales.

This unique award was established 16 years ago to recognize just such achievements by corporate organizations. It was first presented in 1933 to Carbide & Carbon Chemicals Corp. for its pioneering in synthetic organic chemicals derived from ethylene and propylene. Two years later, the second award went to the Organic Chemicals Department of E. I. du Pont de Nemours & Co., Inc., for twin achievements: the production of neoprene from acetylene and the commercial synthesis of camphor from American turpentine. Monsanto Chemical Co. won the third award in 1937 for the large-scale development of elemental phosphorus, while the fourth went to the Standard Oil Development Co., which had come up with new aviation fuels and synthetic chemical products from petroleum.

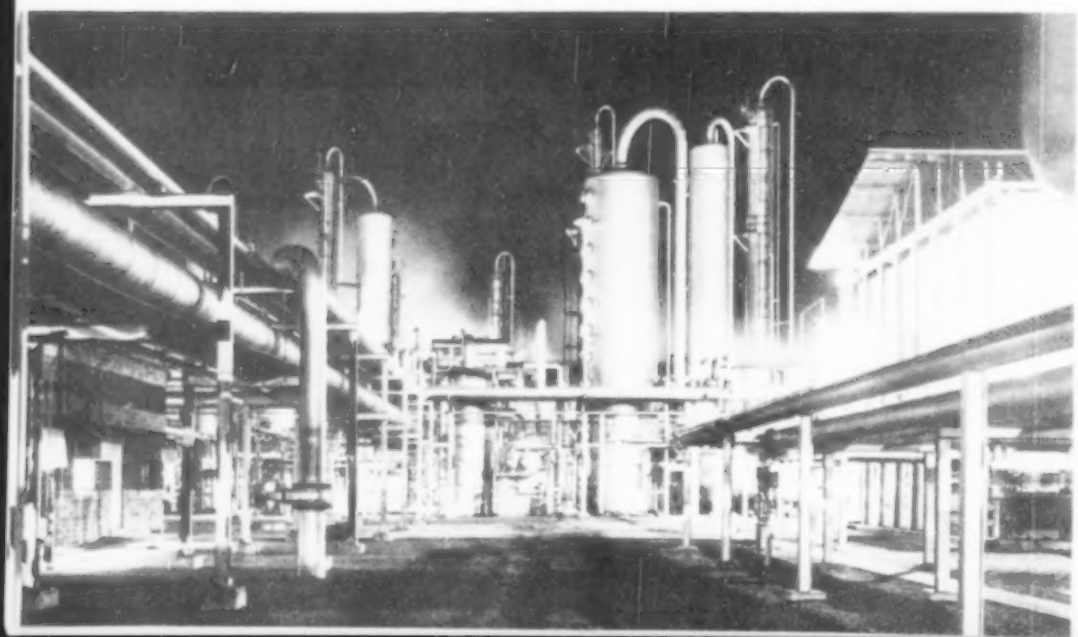
In 1941, just a few days before Pearl Harbor, the Dow Chemical Co. was accorded this recognition for its recovery of magnesium from the sea. At that time magnesium metal was urgently needed for aircraft and munitions.

Then came the U.S. entry into World War II. Overnight, our economy faced mobilization for total war. All our industrial resources were pooled in the greatest group effort in history. Most appropriately, therefore, the committee voted the 1943 award to the entire American synthetic rubber industry, and, two years later, to the more than one hundred companies, universities and research organizations that ended an era—or began another—when they gave us the atomic bomb.

With the coming of peace, the first postwar presentation was to Merck & Co. for distinguished service to humanity in developing efficient production processes for streptomycin. Last year we honored the Shell Development Co. for its successful commercial synthesis of glycerin from petroleum—typical of many years of progress in petrochemicals.

And now the Celanese Corp. of America, which previously shared in the wartime award to the synthetic rubber industry, again takes its place, this time for its individual achievements, on this honor roll of chemical engineering enterprise. Proud of its meritorious contribution to the advance of our industry and our profession, we salute Celanese.

S. D. Kirkpatrick
Secretary, Committee of Award



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Both power and products stem from petroleum hydrocarbons in the new plant at Bishop, Tex.

CHEMICALS—THE KEY TO INTEGRATED GROWTH

How Celanese has knitted together its textile, plastics and chemical operations.

By SIDNEY D. KIRKPATRICK

Chemicalization, if there is such a word, aptly describes a current trend in the changing structure of American industry. Wartime shortages of basic raw materials left unpleasant memories in many quarters. Managements in more and more companies have recognized the essentially chemical character of their manufacturing operations. They have foreseen that the future growth, strength and stability of their enterprises depend upon chemical research. So they have set out to do something about it. But few have been so thorough-going or successful as the Celanese Corp. of America in its program of chemical integration.

Twenty-five years ago Celanese was founded primarily to supply the textile industry with a new synthetic fiber. It has since become the world's largest producer of cellulose acetate yarns. In 1927 it extended its operations into the field of plastics and has now gained an important position among the producers of cellulosic molding materials. But since all of its products are essentially of chemical origin, it was only natural that much of its early research should be directed toward its chemical operations and their raw material requirements. Today, after more than $20 million has been invested in that research, Celanese is in a position to capitalize on its courage and foresight in the "chemicalization" of its corporate structure.

When Celanese completes its post-war program of expansion and modernization, which has already cost in excess of $110 million, it will have spent almost half of that sum for new plants in Texas and British Columbia to produce essential chemical and cellulosic raw materials. New fiber, textile, and plastics plants have been built in Virginia, the Carolinas, and New Jersey. And in all of its older plants at least 60 percent of the production equipment will have been replaced or rebuilt and completely modernized. Such is the outward character of the changes that have in recent years produced the integrated structure shown diagrammatically in the flow chart on a following page.

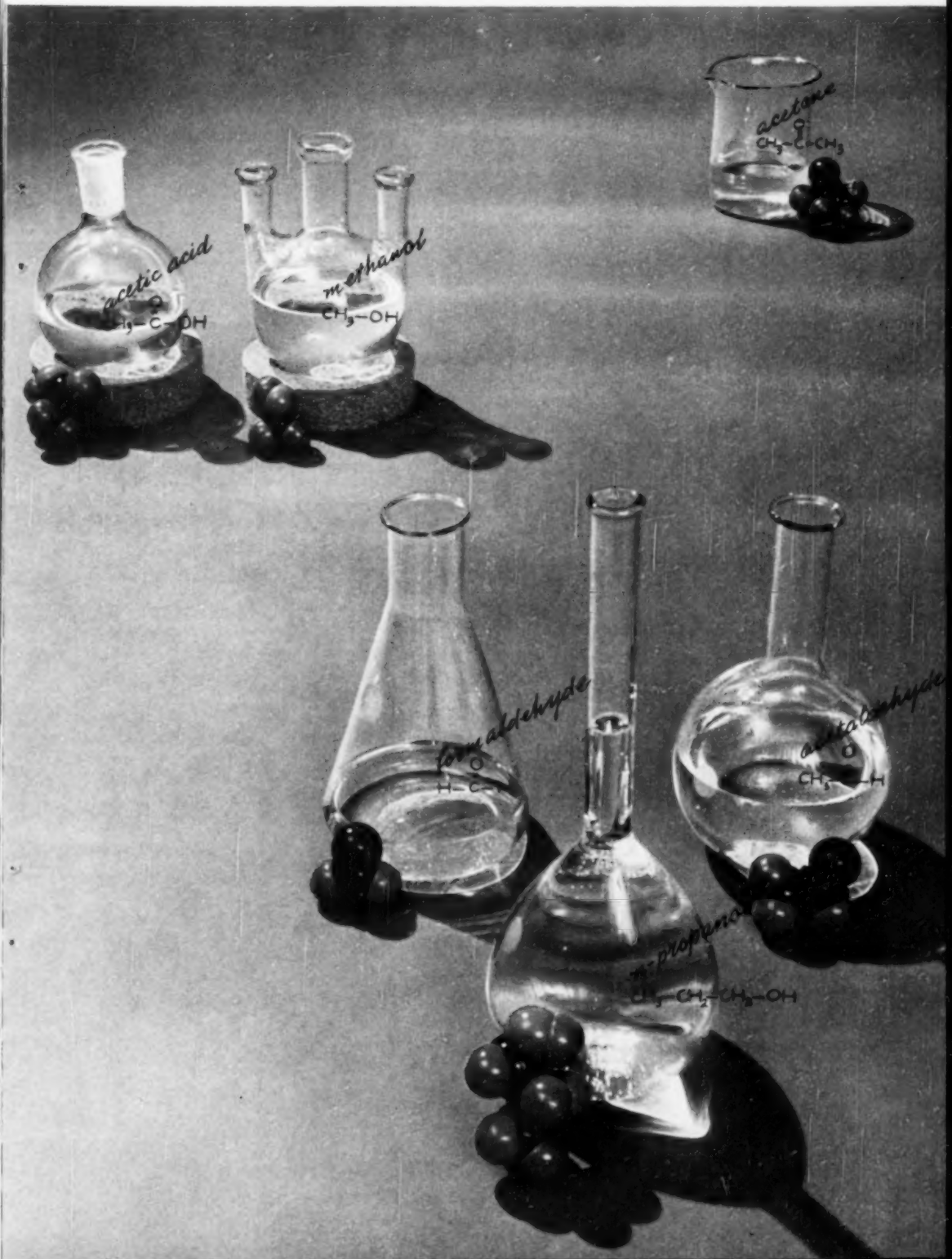
Integration for Celanese has been a two-way stretch. It has expanded vertically to provide facilities for the most basic of its raw materials.* It has grown horizontally to reach greatly broadened markets not only in textiles but also in plastics and organic chemicals. But to view these changes in proper perspective, we must go far back into the history of this enterprise.

Celanese had its beginnings more than forty years ago when the two brothers, Camille and Henri Dreyfus, began their work in a small laboratory in the garden of their home in Basle, Switzerland. They sought and succeeded in developing a method for making cellulose acetate and spinning it into a new textile yarn. Then World War I drastically interfered with their plans. Non-flammable "dopes" were needed to strengthen the fabric of airplane wings. When it was discovered that cellulose acetate ideally served this purpose, the Dreyfus brothers were "drafted" by the Allies and persuaded to transfer their operations to Derby, England. In 1918, at the request of the United States Government, Dr. Camille Dreyfus came to America. A few years later, after many early discouragements, plans were under way for plants in England and America to turn out the new synthetic yarns and textiles to which had been given the name of Celanese.

Today operations based on the original Dreyfus discoveries are carried on in a dozen plants throughout the world.

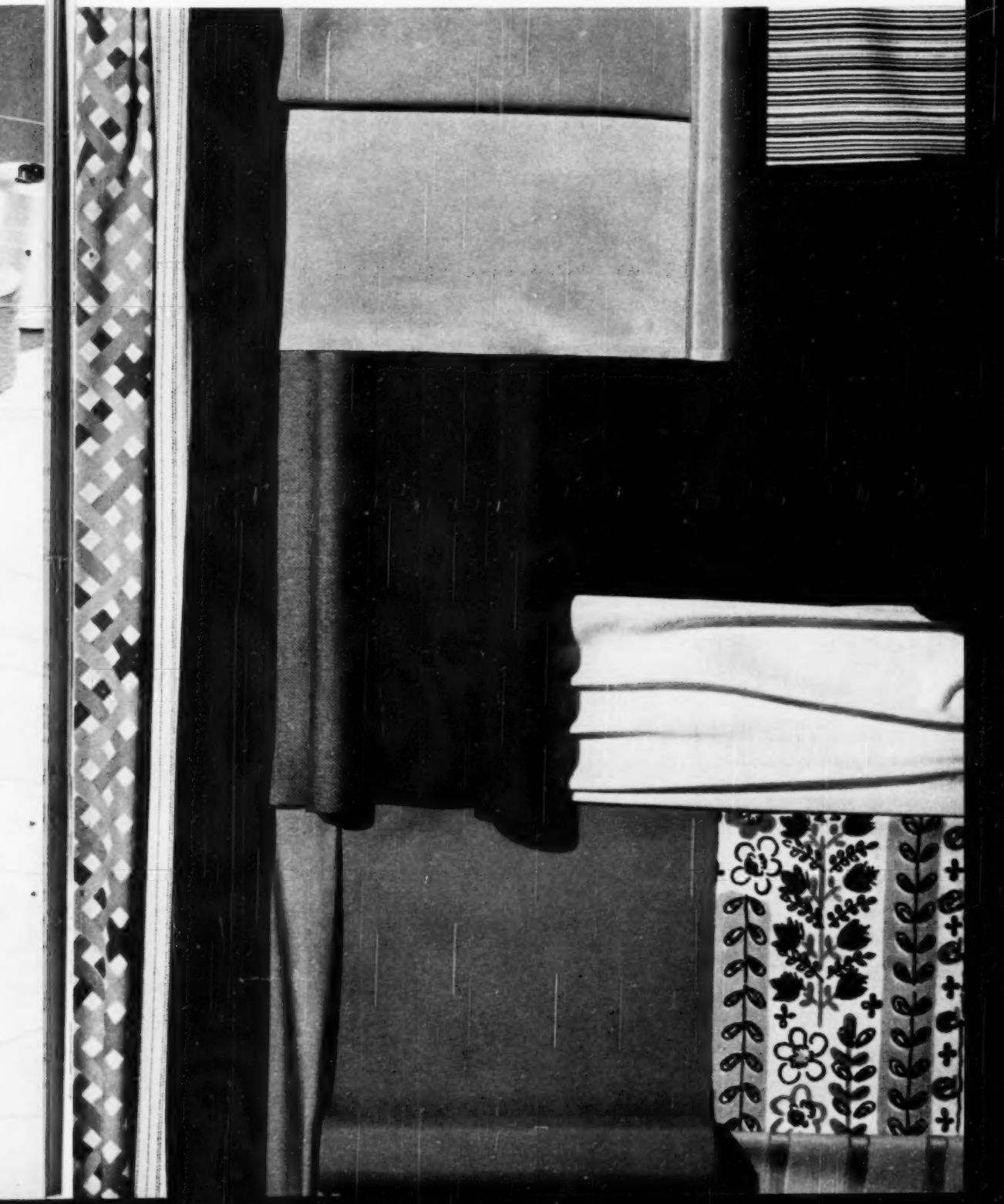
*Celanese management does not seek complete vertical integration. It prefers as a matter of policy to purchase a sizeable proportion of its raw material requirements. In turn it is willing and anxious to sell its basic chemicals to other processors.

These BASIC CHEMICALS made from petroleum hydrocarbons are important raw materials for . . .

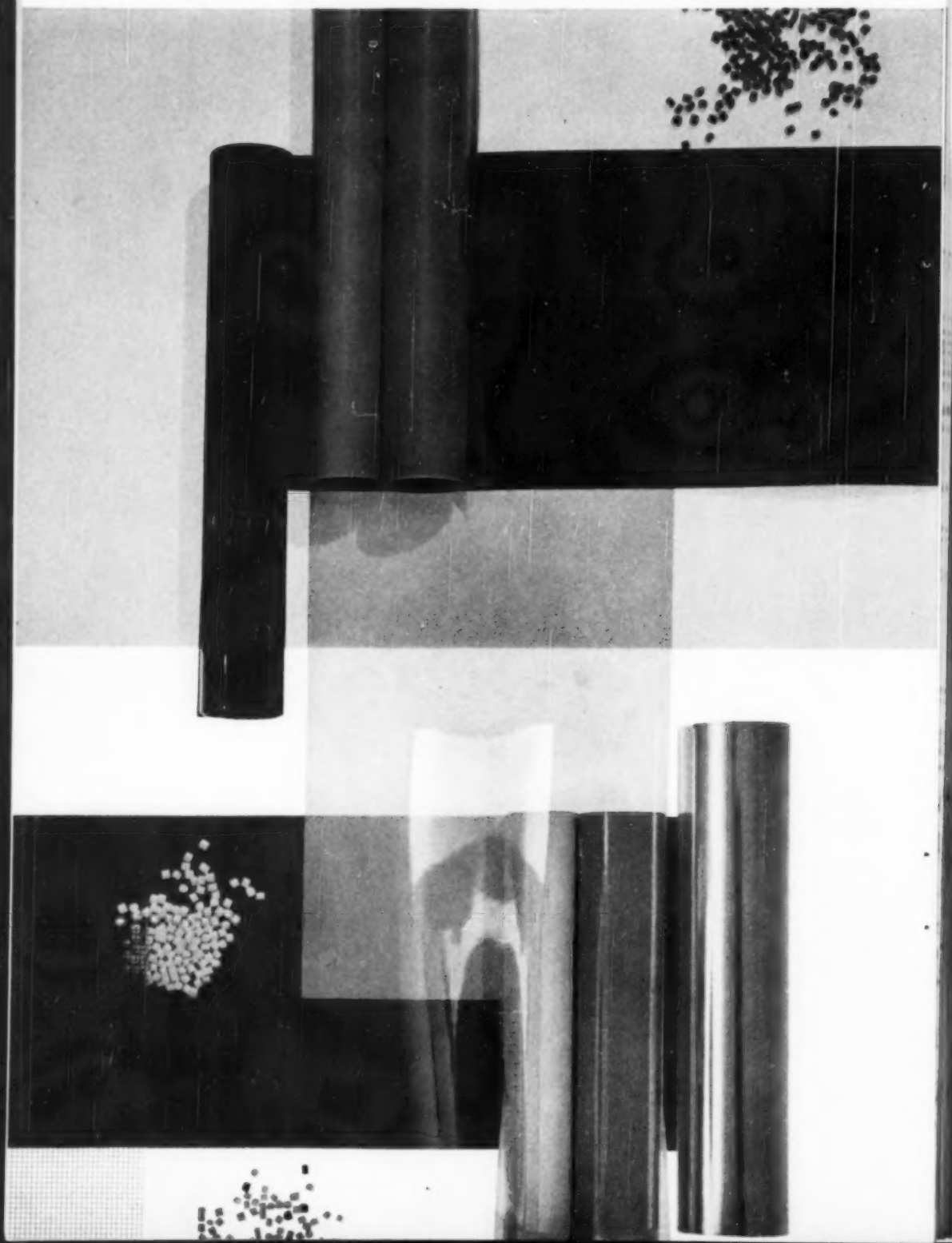


these Celanese YARNS and STAPLE FIBERS of both cellulose acetate and viscose; and . . .

these Woven and Knitted FABRICS that add beauty and wear for all textile uses; and . . .



these cellulosic PLASTICS, FILMS and MOLDING MATERIALS for ever wider utility in our daily lives.



TWENTY-FIVE YEARS OF CHEMICAL ENGINEERING PROGRESS

1924 Celanese Corp. of America begins operations at Cumberland, Maryland, for the manufacture of cellulose acetate.

1932 Research program launched to investigate the manufacture of organic chemical intermediates from petroleum.

1941 $1,500,000 oxidation pilot plant erected at Cumberland, Maryland.

1943 War Production Board gives necessary priorities to begin construction of full-scale chemical plant utilizing oxidation process at Bishop, Texas.

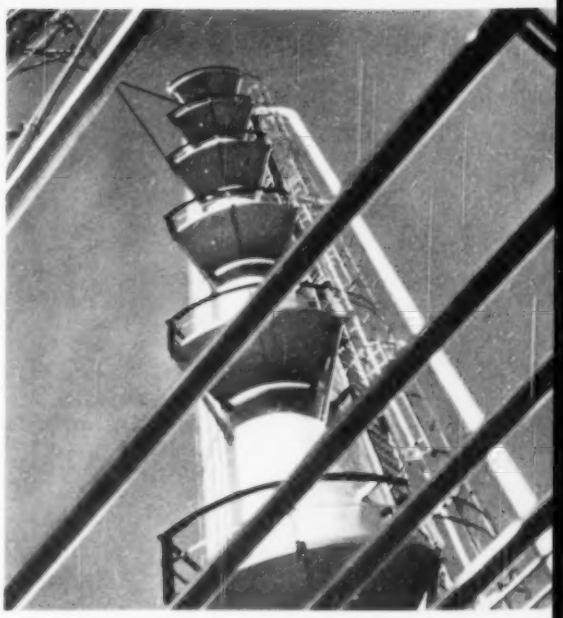
1945 Operations start at new Chemcel Plant at Bishop, Texas. The following chemicals are produced: acetaldehyde, acetic acid, acetone, methanol and formaldehyde.

1946 The Chemical Division of Celanese Corp. of America is established. Production facilities expanded at Chemcel Construction of Petroleum Chemical Research and Development Laboratory is started at Clarkwood, Texas. The following new products are produced: n-propyl alcohol and propionaldehyde.

1947 Clarkwood Research and Development Laboratories begin operations. The following new chemicals are produced: methylal, methyl pentanediol, isopropanol, butanols.

1948 New Pilot Plants installed at Clarkwood. Among the chemicals being investigated in pilot plants are acrolein, and glycols. Tanker transportation of formaldehyde initiated.

1949 Flaked formaldehyde produced in laboratory and now being shipped in carload quantities. Isobutanol and n-butanol production initiated. Propylene glycol soon to be produced on a large scale.



Symbol of growth, this tall fractionating column for the separation and purification of acetaldehyde.

But our interest here is primarily concerned with those of the Celanese Corp. of America.

During its early years the corporation concentrated its efforts on developing and perfecting processes for producing cellulose acetate from cotton linters and acetic acid, and the further processing of this material for conversion into synthetic textile and plastic materials. Simultaneously it began to build a competent research organization and a well-balanced staff of chemical engineers.

But it was soon apparent to its technical management that to maintain leadership in the cellulose acetate industry, Celanese would have to provide independent sources for at least half of its basic raw materials. So in 1932, when many corporation heads were retreating to their storm cellars, Celanese launched an extensive research and development program, directed primarily toward the basic organic chemicals that it needed most—acetic acid and acetone.

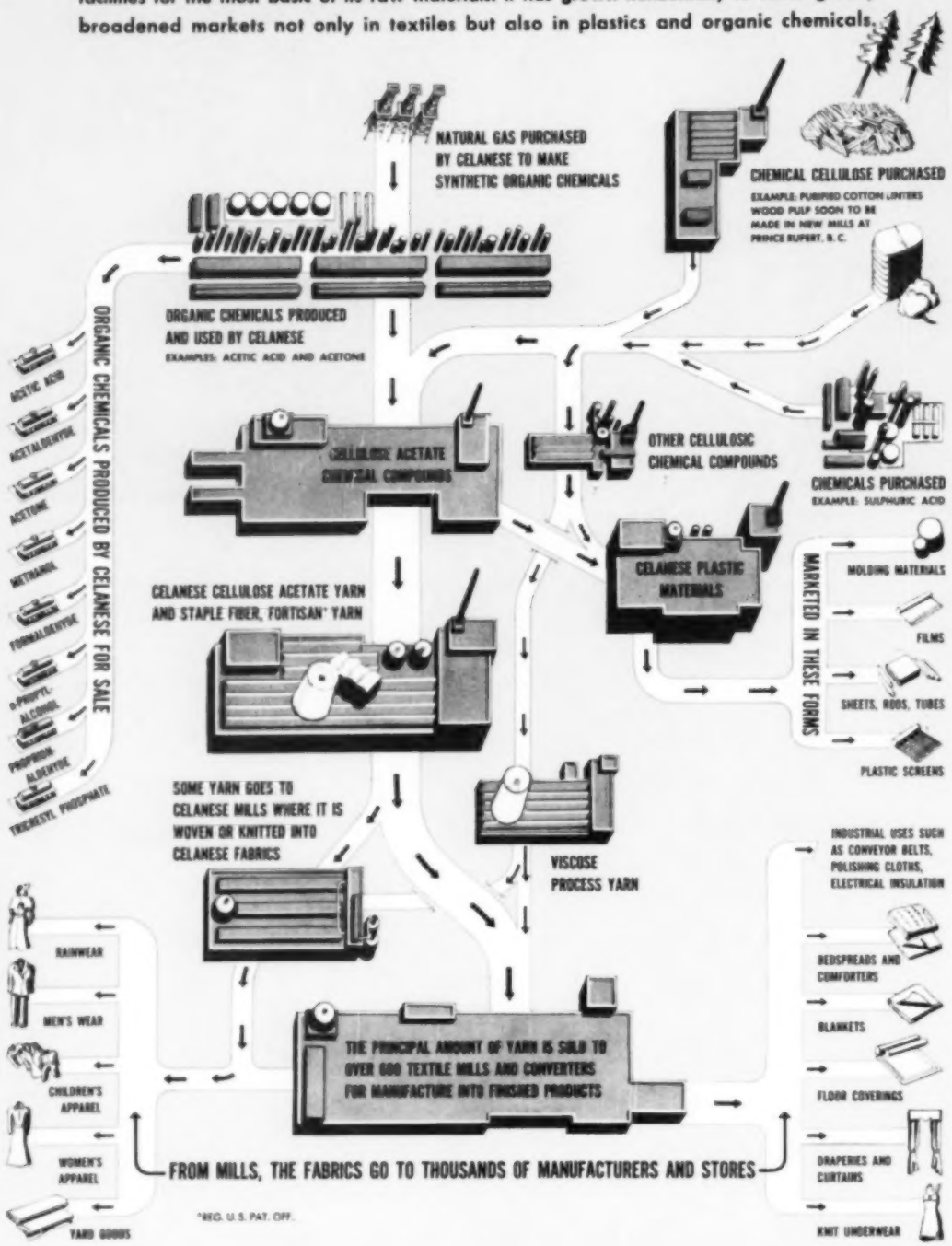
They looked first toward petroleum and natural gas—then virtualy unexplored fields for chemical exploitation. Three methods were considered for attacking the heretofore unreactive paraffin hydrocarbons that were to serve as starting materials. Two of these methods, cracking (or dehydrogenation) and halogenation (e.g. chlorination), had already been explored and developed by others. So Celanese chose the third—and most difficult—namely, direct oxidation. Patient, pioneering research eventually came up with a practical process which was gradually to progress through a series of pilot plants. Finally, by 1941, it was decided to build a large semi-works at Cumberland, Md. More than $1.5 million was spent in this operation which, by the end of 1942, had provided the basic process and design data needed for the construction of a full-scale plant. Plans were prepared and an appropriate site purchased on the Gulf Coast of Texas. But again another World War interfered. Critical construction materials were under strict allocation for essential military uses.

But as the war progressed, even more critical shortages developed among the basic chemicals,—particularly, acetaldehyde, butadiene, and pentaerythritol. In July, 1942, the Referee Board of WPB sent the late Dean Frank C. Whitmore and the writer of this article to Cumberland to investigate and report on the Celanese oxidation process. We were favorably impressed with its possibilities and recommended that the corporation be granted the necessary priorities to construct the Texas plant. Almost a year elapsed before the final clearance was obtained. But by the end of 1943 construction had started on a 500-acre plant site in the heart of the rich natural gas fields of southeastern Texas. Eighteen months later the first unit was put on stream, and by the end of 1945 this country saw its first sizable production of acetaldehyde, acetic acid, acetone, methanol, and formaldehyde from petroleum hydrocarbons by direct oxidation.

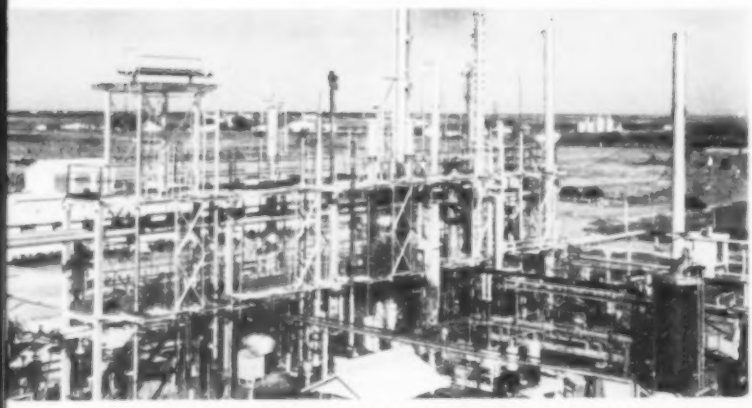
The technical features of this huge plant have already been described in these pages. (See "Chemcel Petrochemicals," *Chemical Engineering*, July 1948, pp. 105-7, 136-9). But a recent visit provided an unusual opportunity for me to gage the rapid growth and progress of this project. Seldom have I seen a more impressive application of modern chemical engineering design and construction. Its tanks, towers and stills have indeed given Texas a new skyline. But equally impressive is the energy and enthusiasm of the men who are in charge of its operations. They take evident pride and satisfaction in their work, in the fine new records they set up, only to better them later through ever higher efficiency and productivity. As one who has watched this interesting

HOW CELANESE HAS INTEGRATED CHEMICALS, TEXTILES AND PLASTICS

Integration for Celanese has been a two-way stretch. It has expanded vertically to provide facilities for the most basic of its raw materials. It has grown horizontally to reach greatly broadened markets not only in textiles but also in plastics and organic chemicals.


NATURAL GAS PURCHASED BY CELANESE TO MAKE SYNTHETIC ORGANIC CHEMICALS
CHEMICAL CELLULOSE PURCHASED
EXAMPLE: PURIFIED COTTON LINTERS WOOD PULP SOON TO BE MADE IN NEW MILLS AT PRINCE RUPERT, B. C.
ORGANIC CHEMICALS PRODUCED AND USED BY CELANESE
EXAMPLES: ACETIC ACID AND ACETONE
ORGANIC CHEMICALS PRODUCED BY CELANESE FOR SALE
ACETIC ACID
ACETALDEHYDE
ACETONE
METHANOL
FORMALDEHYDE
n-PROPYL ALCOHOL
PROPIONIC ALDEHYDE
TRICRESYL PHOSPHATE
CELLULOSE ACETATE CHEMICAL COMPOUNDS
OTHER CELLULOSIC CHEMICAL COMPOUNDS
CHEMICALS PURCHASED
EXAMPLE: SULPHURIC ACID
CELANESE PLASTIC MATERIALS
MARKETED IN THESE FORMS
MOLDING MATERIALS
FILMS
SHEETS, RODS, TUBES
PLASTIC SCREENS
CELANESE CELLULOSE ACETATE YARN AND STAPLE FIBER, FORTISAN* YARN
SOME YARN GOES TO CELANESE MILLS WHERE IT IS WOVEN OR KNITTED INTO CELANESE FABRICS
VISCOSE PROCESS YARN
INDUSTRIAL USES SUCH AS CONVEYOR BELTS, POLISHING CLOTHS, ELECTRICAL INSULATION
BEDSPREADS AND COMFORTERS
BLANKETS
FLOOR COVERINGS
DRAPERIES AND CURTAINS
KNIT UNDERWEAR
RAINWEAR
MEN'S WEAR
CHILDREN'S APPAREL
WOMEN'S APPAREL
YARD GOODS
THE PRINCIPAL AMOUNT OF YARN IS SOLD TO OVER 600 TEXTILE MILLS AND CONVERTERS FOR MANUFACTURE INTO FINISHED PRODUCTS
FROM MILLS, THE FABRICS GO TO THOUSANDS OF MANUFACTURERS AND STORES
*REG. U. S. PAT. OFF.

Chemcel, the world's largest plant for producing synthetic organic chemicals by direct oxidation of propane and butane gases.



New processes are developed and improved in this pilot plant at Clarkwood, Tex.

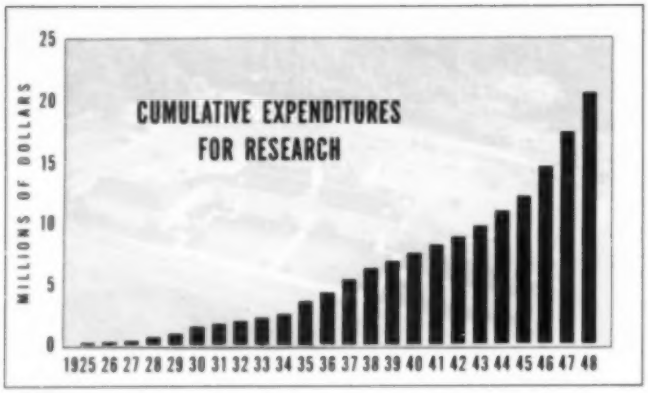
Higher-alcohol producing unit and hydrogen plant are shown in the foreground.

development from its early stages. I gained new inspiration from this evidence of chemical engineering teamwork and achievement.

In 1946 the importance of these operations were such that the corporation established a separate Chemical Division under the management of young and able chemical engineers. Meanwhile new production units were put on the line, and as their output mounted, operations were extended to produce such chemicals as n-propyl alcohol and propionaldehyde – both of which were of special interest in connection with the development of the new and promising plastics. In 1947 came methylal and methyl pentadiol, both of which already have new and important commercial uses.

An important development in 1948 was the first use of tankers to transport formaldehyde from Corpus Christi, Texas, to New Haven, Conn. This in itself was a minor chemical engineering achievement. Careful choice of construction materials to be in contact with the formaldehyde solution, close control of temperatures in transit, elimination of fumes, and other precautionary measures presented real chemical engineering problems. In addition, shore tanks and loading facilities at Corpus Christi and New Haven had to be erected, tank car and trucking services established – all under chemical engineering supervision.

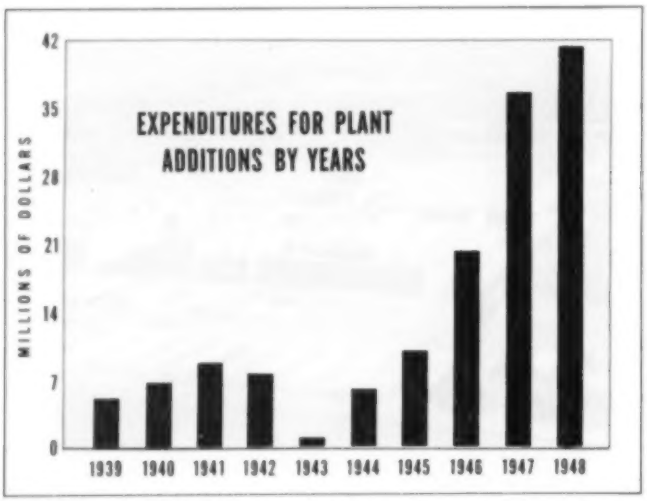
One of the most important developments during 1949 has been the production of flaked formaldehyde in carload quantities by a new process now operating in semi-works. The important economies obtained by eliminating the need for transporting two pounds of water for every pound of formaldehyde (100 percent) help greatly to offset the 2,000 or more miles between



Since Celanese initiated its research program, more than $20 million have been invested — much of it in the new laboratories in Summit, N. J.

Texas and the important consuming industries in the Middle Atlantic states. Enthusiastic reception of this form of formaldehyde, at the price at which Celanese was able to offer it, has encouraged the corporation to proceed immediately with the design and construction of the large-scale unit. Other developments during 1949 at Chemcel include the commercial production of propylene glycol and the start of industrial scale operations for normal and iso butanols.

Not all of the program for assuring adequate supplies of essential raw materials is confined to chemicals. Faced with a growing world shortage of cellulose, Celanese in 1947 made an unusual arrangement with the government of British Columbia whereby it was licensed in perpetuity to use a vast tract of Canadian timberland. Through scientific management and planned reforestation, a perpetual supply of cellulose is now assured. Construction is already far advanced on a wood-pulp purification plant near Prince Rupert where a new process developed by Celanese research is being installed. Production is expected to get under way early in 1951. Excellent facilities for ocean, rail and highway transportation were acquired through the purchase of Watson Island, which was used during the war as a supply base by the U. S. Army.



Expansion and modernization of plant facilities has called for total expenditures of more than $110 million since Celanese launched its postwar program.

Reference has already been made to the vital role of research in the success of the integration program. As shown by an accompanying chart, more than $20 million has been invested in research since 1925. In 1948 the expenditure was $3,200,000—1.4 percent of sales.

In addition to its centralized research laboratories in Summit, N. J., the company has established in Texas a unique experimental station for petrochemical research and development. Located on a 50-acre tract of Clarkwood, about 25 miles from the Chemcel plant at Bishop, this new research center already requires the services of about a hundred employees in its laboratories and the pilot plants. More than a third of these are chemists and chemical engineers working on process improvements and the development of important derivatives of the primary products made at the Bishop plant.

As part of its research program and in recognition of its debt to the colleges as a continuing source of technical personnel, Celanese has established five graduate fellowships. Two are in chemical engineering at Michigan and Princeton, two in chemistry at the University of Texas, and one at Rutgers for industrial research in food packaging. Closely related is the work of the Dreyfus Foundation which Dr. Camille Dreyfus established in 1947 to promote the advance of chemistry and chemical engineering in American universities. Grants have been made to support fellowships and for the purchase of essential equipment and other facilities.

On September 22, 1947, the Celanese Corp. of America provided further proof of its interest in chemical engineering as a profession when it established the Professional Progress Award in Chemical Engineering. Administered by the American Institute of Chemical Engineers, it annually provides a certificate and generous gift to honor a chemical engineer under 45 years of age who has contributed significantly to the chemical engineering profession. The first award was made late last year to Dr. Allan P. Colburn of the University of Delaware.

From a technically-minded, progressive management has come the impetus for this impressive program of chemical development and industrial integration. Chemical engineering has indeed been integrated into the whole structure of the Celanese enterprise. It has not only provided assurance for future raw material requirements of an expanding enterprise; it has provided the strength and resourcefulness that can carry the company to ever greater achievements.

Technology and Equipment Head for Higher Process Efficiency

With the approach of the twenty-second New York Chemical Show the end of this month, the editors turn their thoughts to the interplay between technology and equipment, and trends that may result

EDITORIAL STAFF

All along the line today, process industries find themselves in need of more efficient methods, for profit margins have been cut and productivity has barely increased since the end of the war, yet wages have steadily forged ahead and may go higher. This is why ideas that lead to better methods are worth more today than ever before, and why also that it seems worthwhile to look into the technologic and equipment developments of the recent past, to discern if possible what the trends for the immediate future may be.

Materials Handling

Better materials handling can be one of the most fertile sources for savings wherever solids or semi-solids are to be moved. Probably the most striking developments have been occurring in the realm of the fork truck. These have been so numerous and so dramatic that they tend to obscure advances in other materials handling directions. Actually, the fork truck and palletized load are by no means the most important handling method in process industries. Conveyors of various sorts will remain the chief reliance in most such industries, simply because the forms of raw materials, intermediates and products very often do not fit the discontinuous unit load character of the fork truck. Most process industries are inherently bulk industries, and their processes tend to be continuous wherever possible.

Since the war the most notable material handling trends seem to fall in the diversification of the power truck handling methods and the expansion of scope of the belt conveyor. An almost endless list of fork truck variations has come from the drafting boards, usually aimed at some specific type of application. Drums, for example, can be picked up in groups of four, without pallets. Unit loads can be picked up on pallets, carried to freight cars or storage, and then pushed from the pallet for shipment. Forks can be replaced with all sorts of special lifting devices for specialized loads which can be dug, tilted, dumped, elevated, or disposed of as suits the particular problem. Small hand-guided power trucks have followed in the paths of the larger operator-carrying trucks and can now perform most of the same evolutions.

The quest for cheaper methods of pallet shipment still goes on, so far without much progress. Numerous efforts to develop pallets cheap enough to be considered non-returnable have been only partially successful. Pallet pools as a means of avoiding need for returning pallets still have made little progress. Pallet standardization is still being worked on, but is far from complete. Freight rates on pallet returns are still too high for comfort. To date the best solution to this problem, which in a sense begs the question, is the "take it or leave it" type of pallet handling system in which the pallet is used internally in the plant, but does not travel with the load when it is finally shipped.

Conveyors

Among conveyors, developments have not been very striking, though progress is evident. Use of belts as long distance common carriers has been proposed and may lead eventually to actual installations for moving large tonnage materials, such as ores and coal. Meanwhile, belts themselves continue to improve both in load-carrying capacity and in resistance to unfavorable operating conditions, such as high temperatures. Belt carriers are appearing in new designs, featuring simpler construction and easier lubrication.

There have been relatively few really novel ideas of recent years in the conveyor field. One is the "Zipper" type belt which incloses its load to avoid dusting and permits a belt to convey in any direction. Another is the "Air-Slide" conveyor which moves solids down a gently sloped trough by fluidizing with air admitted through the porous trough bottom. Finally, several related developments in fluidizing for feeding purposes have come on the scene, using dense-phase fluidizing of granular and powdered materials where a high degree of feeding accuracy is necessary.

Fluids Handling

Much improvement is occurring in the handling of both liquids and gases. Taylor's assay of pumping trends (*Chem. Eng.*, May 1949, p. 128) called attention to the basic problems which may be summarized as involving maintenance of suction, reduction of leakage, and lowering of costs. Progress has been made in all three of these lines, although the greatest improvement has come about in the last two. The trend toward rotating pumps, and away from reciprocating, has continued. In process industries, where there is more and more need for handling light liquids near their boiling point, the trend toward centrifugal pumps is particularly notable. These last are moving toward higher speeds—3,500 rpm., or even higher, rather than 1,750 rpm. In many designs, packing improvements have been notable, especially in the substitution of mechanical seals for conventional stuffing boxes. For certain problems, vertical pumps have tended to displace the horizontal, especially where multi-staging at low capacity is necessary. So-called process pumps have been markedly improved design-wise, to increase strength against pipe strains when handling hot liquids, and to facilitate dismantling

and maintenance. For special purposes, several different methods of eliminating stuffing boxes and seals entirely have moved into actual use.

COMPRESSORS

To some extent, compressor progress had been moving similarly to that in pumps. For very high pressures, reciprocating machines are pre-eminent, but elsewhere rotating constructions are gaining ground.

Among the reciprocating machines, the trend is toward simplification, higher speeds, greater compactness, and much greater capacities where called for by process needs. As process pressures move higher, some into the thousands of atmospheres, compressor design is evidently keeping pace, although a tendency has been noted to use intensifiers rather than compressors for the highest pressures.

High capacity rotary compression equipment has been developing in two directions, toward the centrifugal and toward the axial flow types. This is particularly true where high compression efficiency may make the difference between a successful and an unsuccessful process. Examples fall in the field of the gas turbine and in tonnage oxygen. Modern compressors of both these types have gone a long way toward the goal of maximum attainable efficiency. Axial compressors, for example, are regularly reaching 85 percent over-all adiabatic efficiency, with some crowding 90 percent. Compression ratios of as high as 12 to 1 and as many as 20 stages are possible in a single machine. For somewhat smaller capacities and slightly lower efficiencies, the centrifugal compressor is now moving toward widespread use where lower compression ratios, say, 4 to 1, are needed. The big tonnage oxygen plants recently completed or now under construction, as well as some of the long distance gas pipelines, are using centrifugal compressors.

VACUUM PUMPING

In vacuum pumping, the problems have been centered more on the application side than in the equipment itself. Ejectors, for example, which now largely fill the niche just above the extreme high vacuum field, have not been changing much in design. Until more performance data are available, especially concerning the effect of molecular weight and suction temperature of the material handled, it seems likely that further equipment improvements cannot be used with maximum effect. In extreme high vacuur, where diffusion pumps are the primary pumping device, problems have dealt mainly with suitable designs for the associated processing equipment, and with the development of processes capable of using high vacuum to advantage. High vacuum engineering is still too new to be a fully predictable science and process design is still, to a considerable extent, empirical.

PIPE AND VALVES

These essential elements in the fluids handling picture are tending in the direction of increased utility, easier installation, lower weight. Pipe, at least in the case of the more expensive construction materials, has tended to get lighter so as to reduce both cost and weight. Larger valves for higher pressures have become lighter through improved bonnet designs. There has been some development of specialized fittings to improve installation—for example, brazing fittings for steel pipe, where formerly this type was produced only for brass and copper. There has been continuing development of compression and similar tubing fittings, both to facilitate installation and to minimize the destructive effects of vibration sometimes met with such joints.

Valve sealing methods have undergone considerable improvement. For example, several chemical valves are using Teflon as a sealing member. Metallic bellows and flexible nonmetallic diaphragms are finding increasing use in valves where they are substituted for the ordinary packing. A most striking innovation in sealing lubricants for plug valves has recently been announced. This is a grease which is actually compressible and can therefore feed under its own pressure for a long time after the valve reservoir has been filled.

Process Energy

New methods of producing and handling process energy have not appeared with any regularity and new ideas are few and far between. Most of the novelty is found in activities remote from processing, for example, in the development of power plants for aircraft, rockets and guided missiles. The most important of all these new developments in energy production, namely, nuclear fission, is still evidently many years away industrially. However, older ideas have been evolving. The gas turbine has been going through an intensive period of development and installations now being made will soon be ready to show the progress that has been accomplished. What appears to be the first successful U. S. installation of a low-temperature coking process is now operating in the Pittsburgh area on bituminous fines. Perhaps indicative of a trend, a new Alcoa aluminum pot line in the South will use electricity developed from natural gas by the largest gas engine-generator installation ever built, a marked departure from the well-grounded tradition of using hydro power in manufacturing aluminum.

Heat transfer methods have shown some recent improvement. No new heat transfer media have been brought out commercially in several years, although advances in application of the previously known media have not been infrequent. For example, the nitrate-nitrite mixture Hi-Tech is now available in a packaged heat release and heat transfer unit. It is no more difficult to install and operate than a small steam boiler. The aryl silicates have become more nearly commercial. Dowtherm heat generators have experienced further refinement, for example, in self-contained electrically heated units for smaller installations.

Heat exchangers of the conventional types have changed little in recent years. Mainly, the changes have been in new ways of employing extended surface elements of otherwise usual types. The most important departures in heat exchanger construction have occurred in the gas-gas type, primarily for use in tonnage oxygen, and in closed and recuperative gas turbine cycles. Several novel methods of securing the enormous amounts of heat transfer surface needed for oxygen process exchangers have been developed, generally in the direction of using metal stampings which can readily and cheaply be built up into exchangers of any desired surface area. The most novel of these, incorporating a construction which will doubtless prove interesting in many applications outside the oxygen field as well, is scheduled for formal announcement next month.

When it comes to temperatures above the limits for metallic heat transfer surfaces, the old checker-brick regenerator and the silicon carbide recuperator have now gained competition from the war-developed pebble heater. Temperatures of 4,000 deg. F. and even higher are being used, it is understood, in the direct nitric-acid-from-air process now being developed experimentally by Food Machinery & Chemical Corp. On the other hand, much lower temperatures, below 1,800 F., have been used also in producing ethylene and aromatics from hydrocarbons in Socony-Vacuum's Thermofor pyrolytic cracking process. This last uses a moving peb-

ble bed with the pebbles conveyed by gravity from the heater to the reactor. The first named process, at least in its early stages, used fixed pebble beds with frequent reversal of the flow from one bed to the other.

At the opposite end of the heat transfer scale, insulation, the techniques of insulating outdoor plants have been developing, although new insulations themselves have been fairly unusual. Introduced several years ago, silica aerogel has just recently gone into its first large industrial application in the outdoor type tonnage oxygen plant of McCarthy Chemical Co. at Winnie, Tex. Because this new super-efficient insulant powder flows readily through the smallest opening, entirely new insulation methods had to be developed for the pipes, valves and equipment of this plant.

Disintegration

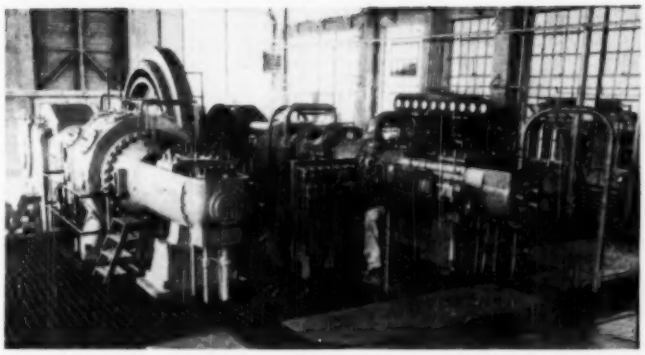
It has been several years since a new idea in grinding has appeared commercially, although several of the older type mills have undergone further development, usually from a mechanical standpoint. For example, a jaw crusher which eliminates rubbing action is now being built also in the East, following its recent development by a Western manufacturer. Jet mills are going into new applications, and it has been established that such equipment, despite apparent high operating costs, is actually the most economical for extremely fine grinding. Mechanical mills for somewhat coarser grinding have shown a few innovations, such as a "packaged" fine grinding assembly comprising mill, feeder, collection equipment, and control devices, factory assembled and ready to operate as soon as the power is connected.

Mixing

Mixing, still largely an art, is being subjected to continuing study and is moving slowly toward the status of a predictable science. A few new mixer types have been introduced in recent years, but the main effort is being put on improvement in application of the already over-complex array of existing types. In solids mixing, a new idea is to use a pump-like impeller to project material radially against a ring at extremely high speed and so achieve homogeneity almost instantly and on a continuous basis. A new continuous mixer for fairly light semi-solids pumps the mixture over the two faces of a toothed rotor disk, the teeth of which move between comparable stationary teeth on stator plates at each side of the rotor. This machine also is continuous. For some heavy semi-solids, continuous operation has been achieved by cascading a group of double-arm mixers so that one machine feeds the next and effectively avoids short-circuiting.

To an increasing extent, mixing is being made automatic by combining cycle-controlled mixers with automatic proportioning and feeding equipment. Some of the more recent installations are completely automatic, requiring no attention after the "start" button is pushed. Automatic proportioning and mixing have, of course, been practiced for a long time in liquid mixing, but the idea is much more recent applied to solids and semi-solids.

Liquid mixing has enjoyed most of the theoretical study accorded this unit operation and, if the answers have not been secured, at least the problem has become better understood. It is now generally possible to scale up from laboratory tests and to anticipate power and time requirements with fair accuracy. Furthermore, although there is obvious overlap, it is now generally possible to distinguish qualitatively among the uses and limits of the various liquid mixer types.

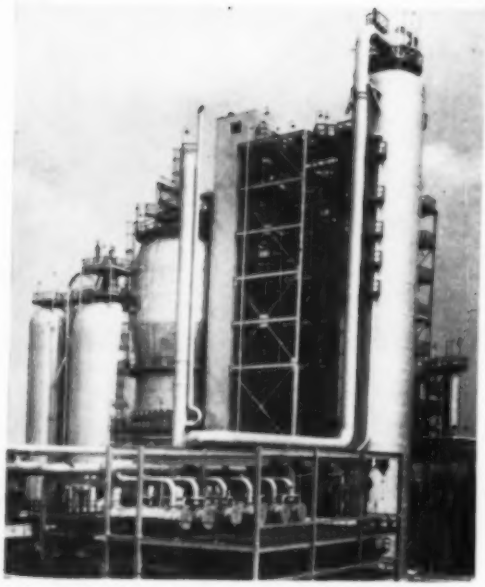


HIGH PRESSURE. Seven-stage 1,000-atm. compressor in Bureau of Mines' coal hydrogenation demonstration plant, Louisiana, Mo., handles 210,000 cfh. of hydrogen.

High Pressure

Since many reactions are moving toward higher pressures, design of high-pressure pumps and compressors, valves, piping, instrumentation, heat exchangers and reaction equipment is attaining greater importance. Pressures of 5,000 psi. are common today, with other processes already operating commercially at as high as 30,000 psi. Even higher pressures are under laboratory investigation. Present vessels to contain such pressures are generally either solid forgings, or of prestressed multi-layer welded construction. However, much thought is being given to other constructions in which prestressing of the outer layers can be developed during manufacture in order that, under working pressure, substantially uniform stress will be developed throughout the vessel wall and thus make most economical use of the wall material. Under consideration are ribbon-wound constructions such as those developed in Germany, shells prestressed by several layers of spirally deposited weld bead, and finally, heavy walled monobloc vessels prestressed by the autofrettage method which has long been used in making gun barrels.

Some of the trickiest design problems in high-pressure work have come from closures and valves. General tendency today on closures is to use some form of pressure sealing device in which the internal pressure acts to compress a gasket, rather than to supply the needed gasket pressure through the bolting of the head or bonnet. In variations of the Bridgeman type closure, the head itself is forced outward by the pressure, to compress the gasket. In the Du Pont delta-ring closure, the pressure operates directly on a gasket of special cross-section to wedge it more tightly in a groove between the head and the vessel flange. Bonnet constructions of such types solve one of the three principal problems in valves for high pressure. The other problems, seat materials and packing, have been solved without too much difficulty through the use of super-hard alloys for seats, and deep stuffing boxes for packing. However, where the valve must operate easily, as in control valves, the deep stuffing box produces too much friction. In at least one design the use



FLUIDIZATION. This newest and largest fluid cat cracker is at Esso Standard's Bayway refinery, at Linden, N. J.

HYPERSORPTION. Foster Wheeler-built Hypersorber recovers methane from natural gas in Rohm & Haas' HCN plant.

of Teflon seals seems to have been the answer.

The main control problem brought about by high pressure arises from the fact that in flow and level control the differential pressure measured cannot be more than a very small fraction of the total pressure. This means that exceptionally accurate measurement is required which makes non-differential pressure methods desirable wherever possible. One solution currently used on level control is to employ a meter based on absorption of gamma radiation by the liquid in the vessel, instrument response depending directly on the height of liquid column through which the radiation must travel.

Fluidization

Use of fluidized solids for bringing about contact between solid and gaseous phases, after the initial spurt in catalytic cracking units during the war, has quieted down to seek its natural level in what eventually will be a wide variety of contacting operations. As is often the case in processes where initial development is empirical, more recent development has emphasized the procurement of data correlations and the development of an adequate theory which, however, is still far from complete. In addition to catalytic cracking, fluidization is being used in oxidizing napthalene and it will shortly go into limestone calcination. Among other projected applications are Fischer-Tropsch synthesis of fuels, coal carbonization, ore roasting, lime sludge calcination, and oil shale distillation. Some possibility of using a fluidized bed for dust and fume collection has been noted.

Fluidization has both advantages and disadvantages. On the credit side, the boiling bed insures high heat transfer and nearly perfect uniformity of temperature throughout the bed. Reaction rates are extremely high, owing to turbulence and large specific surface. On the other hand, countercurrent operation is impossible with a single fluid bed, and to secure even an approximation of such operation requires the use of multiple beds. Similarly, short-circuiting of solids from entrance to exit can be minimized only by multi-staging and the amount of solids loss, if the material is expensive, may be prohibitive owing to inevitable entrainment.

Physical Separations

Much activity has occurred in recent years in the improvement of separation methods, particularly those depending on phase change and on ion exchange. In the field of solvent (solid-liquid) extraction, new extraction processes have been offered, new plants have been built. One new process combines solvent extraction with mechanical pressing. In the closely allied territory of sugar beet "diffusion," continuous diffusers are beginning to displace the batch type formerly employed.

In a number of directions, liquid-liquid extraction seems to be coming into its own. Among tower type extractors the Scheibel method of construction, involving mechanical mixing sections for the two phases, alternating with separating sections packed with wire mesh, seems likely to reduce necessary column heights by a factor which may be as great as 10 to 1 compared with ordinary towers. However, sometimes it may develop that a totally different sort of extractor will prove to be the answer, especially with valuable extracts involving rather small quantities. This is the centrifugal countercurrent extractor developed by Podbielniak some 20 years ago. Only within the last few years has this device begun to find application. It is now widely used in the pharmaceutical field in extracting antibiotics such as penicillin and Chloromycetin from the fermentation broth, and in the recovery of caffeine and hormones. Within a rotor about 20 in. in diameter, this extractor com-

presses a spiral passage 160 ft. long. It is said to give the equivalent of five or more theoretical extraction stages.

DISTILLATION

Equilibrium distillation is an old unit operation in which most of the development is of long standing. Even here, however, improvements are still being sought. One avenue of approach has been through the use of visual models, constructed so that operation can be watched under all conditions. Another is the method used by one company, described elsewhere in this issue, of employing the mass spectrometer to improve column design by studying the products of the distilling system.

Newer types of distillation, particularly extractive and molecular distillation, have been progressing rapidly. Several important applications have used water as the extracting agent, others furfural. Molecular distillation, which up to the present has been primarily a concentrating method rather than a means of accurate separation, may also become capable of close separation of heat sensitive materials through commercial development of stills of the Bowman type. Here a stationary evaporator of cylindrical form surrounds a rotating cylindrical condenser. Material which condenses is thrown off centrifugally from the condenser and re-evaporated. Experimental models have shown separations equivalent to an 18 plate column of conventional type when operated at 200 microns pressure drop. However, the performance is still essentially that of a molecular still in that the path from evaporator to condenser is short, and the vacuum is high.

Interest in the more conventional falling film type of molecular still appears to be increasing. Recently it was reported that a 1½ ton-per-hour unit, probably the largest so far built, was to be installed by one chemical manufacturer.

DRYING

Elsewhere among the separation operations which depend upon vaporization, new principles have not been exploited recently, but there have been significant improvements in details and, in at least one case, adaptation of a piece of drying equipment for a different purpose—continuous sublimation. For this purpose a rotating shelf dryer is being used extensively in closed circuit with a condenser for the purification of organic chemicals by sublimation. Freeze drying, which advanced rapidly during the war in applications on such heat sensitive materials as blood plasma and penicillin, shows signs of slackening off as less heat sensitive products are developed. On penicillin G, for example, crystallization is possible and freeze drying is not needed. Chloromycetin, a less sensitive antibiotic, is safely evaporated under a moderate vacuum to its crystallization point.

Vacuum drying is gaining ground as equipment improvements are brought out. A continuous vacuum dryer for easily damaged crystals is understood to be on the drafting board, while double-drum vacuum dryers have recently joined the older single drum variety following improvements that permit accurate clearance adjustment under vacuum. Spray dryers, long held back by high cost, are making a bid for wider use through the development of moderate sized standard models. Infra-red drying is gaining some ground following recognition of the need for adequate ventilation to discharge the water evaporated.

EVAPORATION

Probably the most notable trend in evaporation is continued interest in the vapor recompression evaporator. It will be recalled that this old idea was revived successfully during the war in the form of the Kleinschmidt sea-water still. This device used a low-cost cycloidal blower powered by a gasoline engine for compressing the vapor given off by the boiling water and thus gave the equivalent of about 15 evaporator effects. The compression ratio was low, but so was the necessary increase in the vapor temperature. Improvements in larger plants can push the performance coefficient considerably higher, giving results equivalent to perhaps 20 effects or more, provided that the solution evaporated has little boiling point elevation and does not scale. Several industrial units are now in operation on water, either producing usable water from brackish supplies, or making distilled water for pharmaceutical plant use. It is understood that there is an installation on black liquor evaporation and a projected unit for the concentration of a waste solution from antibiotic fermentation. Since a vapor recompression evaporator can handle water with a much greater dissolved solids content than is economically possible with ion exchange, some consideration is being given to it for making potable water from brackish supplies in the Southwest, where water supply is becoming ever more difficult.

Another thermodynamic trick which gives multiple-effect performance in a single-effect evaporator has been introduced in at least two different variations for fruit juice concentration. Since these systems evaporate at temperatures in the neighborhood of 60 deg. F. they may also prove interesting applied to heat sensitive chemicals. Like the Kleinschmidt still they use a heat pump principle, but in somewhat different ways. It will suffice to describe how one of these systems works. In this type a refrigerant cycle is used, with the refrigerant acting as the heat transfer medium. The hot, compressed refrigerant vapor from the conpressor is condensed in raising the sensible heat content of the incoming feed solution. The liquid refrigerant then is expanded and evaporated in the condenser which serves the product evaporator. The incoming feed, after being heated by the refrigerant, then flashes into a vacuum chamber which is maintained under a vacuum corresponding to a 60 deg. boiling point by the condensation of the flashed vapors in the already mentioned condenser. All of the energy for the process is supplied by the compressor except for a little auxiliary cooling, and for the steam or electrical energy supplied to the jet or vacuum pump used to remove noncondensibles from the condenser.

FREEZING

Freezing has recently come in for its share of attention as a unit operation through the development of a countercurrent, multi-temperature freeze-concentration process for heat-sensitive water solutions. Although the process will probably find wider application in the food field than in chemicals, for example on the concentration of juices, it may prove useful in partial dehydration of serums, blood plasma and antibiotics. The method may also find some application as a substitute for evaporation of extremely corrosive solutions, since at freezing temperatures the rate of corrosion is much reduced. The process uses several stages at decreasing temperatures, with new ice crystals produced only at the low-temperature end. The crystals are moved mechanically from the colder toward the warmer end of the apparatus, counter to the flow of solution. Thus the crystals grow in successively warmer stages in contact with progressively higher concentration solutions. Separate crystals are formed, rather than a mushy ice, and occlusion of solution in the crystals is negligible. The limitation on the process, which comes from the phase diagram relations of solvent and solute, is that the concentration can only approach the eutectic point as a limit. If complete dehydration is needed, the

concentrate must be dehydrated by some other method.

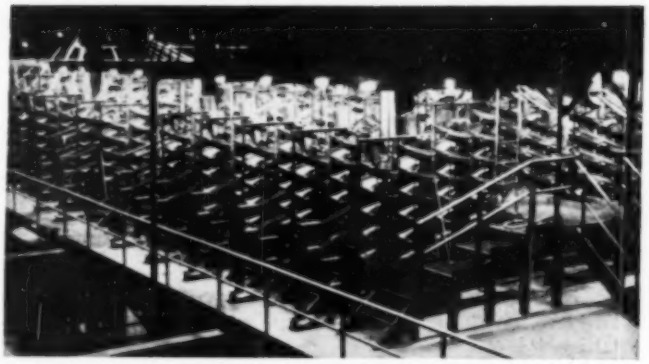
HYPERSORPTION

Some of the most interesting and potentially valuable developments in separations have been occurring in the field of adsorption. Traditionally, adsorption has been used chiefly to separate a condensible vapor from a gas, or to separate small quantities of contaminating materials from liquid products. As examples, silica and alumina gels and activated bauxite are widely used in drying gases, while fuller's earth is used in decolorizing petroleum products, and activated carbon in recovery of solvents and the purification and decolorization of vegetable oils and many chemical liquids. Now adsorption is moving into fractionation operations by two routes: Hypersorption and similar operations, and chromatography.

Hypersorption is a continuous, countercurrent process for the separation of adsorbable from non-adsorbable gases. Since some gases adsorb more strongly than others and will displace less strongly adsorbed materials, separations can sometimes be made when both components are adsorbable. The solid adsorbent moves down a tower against an upward current of gases to be separated. Unadsorbed or less strongly adsorbed gases exit at the top, while the more strongly adsorbed gas is carried out with the carbon or other adsorbent to the regeneration section. Here the adsorbent is heated and steamed to release the adsorbate, then cooled and conveyed to the top of the unit by a gas lift. Carbon flow down the column is controlled by plates and downcomers, which permit gas removal. By making use of the displacement of less adsorbable by more adsorbable material, it is possible to make a three-way cut in some cases, with non-adsorbed gases removed at the top, displaced material removed at an intermediate point, and strongly adsorbed gas in the regeneration section.

CHROMATOGRAPHY

Although at present it is a "last chance" separation which generally will not be used if other methods are available, chromatography makes possible liquid separations in a manner somewhat similar to the Hypersorption separation of gases. Chromatography is a technique that has been used to a small extent for more than 40 years in difficult laboratory separations, but only in the last few years has it moved into the plant. It permits the separation of high molecular weight materials of low volatility, such as biochemicals and petrochemicals, without going to high temperature or high vacuum. So far, it has been used in purification of streptomycin and in producing chlorophyll, xanthophyll and beta-carotene from alfalfa. Present applications have been carried out on a batch basis, but methods are now being sought actively for making the operation continuous, and some are likely to be successful. Indications are clear that much of this work is going on in the petroleum industry which suggests that large scale applications may be imminent.



CONCENTRATION. Humphreys spiral concentrators are an important part of the flowsheet in International Minerals & Chemical Co.'s Noralyn phosphate plant.

Chromatography operates by selective adsorption and desorption. As such it is independent of the usual physical properties used for separations, such as vapor pressure. Operating as it does on the basis of differences in adsorptive coefficients, it can make some separations that are possible in no other way and often does so with almost 100 percent effectiveness even when the chemical properties of the materials are close together. A typical batch operation would be somewhat as follows, although various processes differ in detail: A mixture of chemicals dissolved in a solvent is pumped into the top of a column packed with a suitable adsorbent such as carbon, silica gel or perhaps a tailor-made synthetic resin ion exchanger. The mixture adsorbs in a rather sharply defined band in the first layers of adsorbent. Then pure solvent is pumped in and this gradually elutes the adsorbed materials, causing them to move down the column.

In doing so, however, the less strongly adsorbed materials move down the column faster so that, if the column is long enough, eventually a point will be reached when the entering materials have been separated, each forming a separate sharply defined band of pure material adsorbed in the adsorbent. Further flow of the solvent then takes each band of material out of the column separately, the least strongly adsorbed going first, the most strongly, last. In some cases different solvents may be used in turn to remove the several fractions.

In batch operations, chromatography is slow and can handle little material per dollar of equipment investment. Therefore it is limited at present to high-value materials. If the throughput-investment ratio can be improved materially by development of continuous methods, it will then become an operation to watch, especially in petrochemicals such as the separation of benzene from hydroformed crudes.

ION EXCHANGE

Ion exchange, which partakes of characteristics of both unit operations and unit processes, has gone a long way since its initial introduction for the de-ionization of water. It is being used extensively for that purpose, but is moving rapidly into chemical purifications and recoveries. This expansion has followed development a few years before the war of regenerable organic cation exchangers which can exchange metallic cations in the solution with hydrogen ions from the exchanger; and of anion exchangers which adsorb the acid molecules so produced, so that through a two-stage operation a solution can be de-ionized more or less completely. Work has been pursued very actively on the development of new ion exchangers with properties tailor-made for various specific uses. One of the most important of the new uses of de-ionization techniques is in beet sugar manufacture

and in purifying sugar solutions. The process removes not only mineral electrolytes but also most of the organic non-sugar solids, greatly increasing sugar yield.

Ion exchange has also made a start in many other directions such as removal of formic acid from formaldehyde; recovery of metals from dilute solutions, such as plating wastes; metathesis of salts, such as conversion of streptomycin sulphate to chloride; and separation of mixtures, such as the fractionation and purification of rare earths by the Manhattan District. In applications of the last named type, ion exchange approaches chromatography. Like this latter, ion exchange is at present retarded because it is a batch operation. However, much effort is being directly toward development of continuous methods which when accomplished will greatly extend the range of application.

Mechanical Separations

Development of improved filter media seems to be the most active area of advance in both gas-solid and liquid-solid filtration. Synthetic fabrics for gas filters have been moving toward higher temperatures which enable filters to dodge condensation and corrosion problems. Many of the new synthetic fibers are now available in liquid filter cloths, among them, the Vinyons, Saran, nylon and Orlon. Non-woven filter media have taken on increased importance. Pressure filters are being redesigned in several cases to facilitate cleaning. Precoat filtration is gaining new applications which gives emphasis to the recent development of a continuous precoat filter that automatically removes and replaces the outer precoat layer as it becomes plugged.

The most important recent trends in centrifugal separation equipment lie in applications. To a considerable extent continuous machines are tending to replace batch separators, a fact which applies both to the nozzle discharge types and to the screw discharges types. There is some tendency to speed machines up and thus secure higher separating force, and to apply controlled acceleration and cycle control to the non-continuous types.

Differential Settling

Separations that depend on differential settling have been showing some development in the past few years, both in equipment and in applications. Hydroseparators, which serve as large-capacity substitutes for extremely fine screens, have been growing in size and some are provided with hydraulically operated or automatic rake lifts to prevent stalling of the rake due to overloads. One maker has completely redesigned his rake-type classifier which is now provided with a head motion which makes the path of rake movement virtually a rectangle, except at the ends where a slight rounding of the lifting and lowering movements occurs. The spiral concentrator introduced in 1943 has gone into new uses, especially in the preparation of non-metallic mineral raw materials and is now an important part of the flowsheet of the world's largest phosphate rock beneficiating unit. The Driessen or Dutch States Mines cyclone, formerly only in experimental use in the United States, is now emerging into commercial application. This device closely resembles—but on a smaller scale—an ordinary large-diameter, dust collection cyclone. However, it operates on fine solids suspensions in a liquid, to give a classifying action, and is said to have extremely high capacity. On the dust collection side, small-diameter cyclones have continued to expand their uses and are now, for example, being offered for removing both solids and liquids from high-volume gas streams.

Flotation

Among the separating methods depending on density differences, both flotation and heavy media methods have been gaining ground. Flotation has been moving into sizing operations in the size range near colloidal. It has recently been applied successfully in several extremely unusual applications such as recovery of fossil resins from coal, lithium salts from Searles Lake brine, and ergot from rye. Use has been expanding too in both the metallic and the non-metallic mineral fields. Indications are that this unit operation will move into many waste recovery operations where fine solids or immiscible liquids must be removed from plant effluents before discharge. One of the most unusual projected applications, which has been suggested both in the United States and in Australia, is the application of froth flotation in the handling of fine solids adsorbents. One possible application of this technique is in chromatographic separations where it has been suggested that chromatography may thus be made continuous.

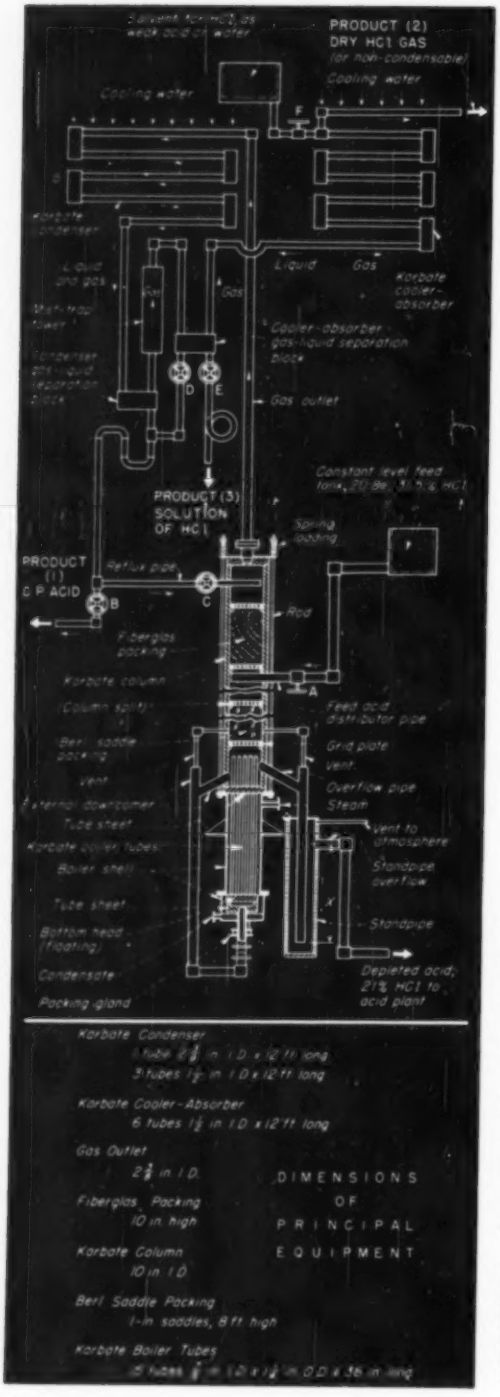
Sink-Float Separations

Sink-float separations likewise seem to be developing rapidly. Here the term is reserved for a separation of solids of two densities by suspending them in a fluid of intermediate density. Although initial efforts with this unit operation used a heavy liquid, the problem of attaining sufficient liquid density is difficult and the result is usually costly unless a salt solution will suffice. Recently, therefore, suspensions of heavy solids have been substituted for the heavy liquids. Most of this work at present employs either finely ground magnetite which is cheap and has the further advantage of allowing magnetic cleaning of the heavy medium; or for higher gravity separations, ferrosilicon which is more expensive but can also be cleaned magnetically. Magnetite is being used on coal cleaning but might also be used for other low gravity minerals such as gypsum and potash ores. Ferrosilicon is being used on iron ore, fluorspar, magnesite, barite, lead-zinc ore, and other metallic and non-metallic minerals. Both flotation and the heavy media processes will gain use as poorer raw material supplies must be tapped.

Instruments and Process Control

Process instrumentation developments took a spurt during the war which has not been matched since. At that time electronic control instruments evolved rapidly and an even more important trend was that toward the introduction of a number of physical instruments for plant analytical use which had formerly been strictly laboratory devices. Among these were the ultraviolet and infrared spectrometers, the mass spectrometer, new adaptations of the emission spectrometers, and X-ray diffraction instruments. Coincident was the development of a number of very high speed calculating devices which proved useful, among other ways, in calculating the results of the analyses performed by some of the instruments mentioned. Many instruments were developed, and have appeared since, for the measurement of radioactivity. Among instruments of more usual types, the changes have been mainly in refinements of older devices. A few of the newer ideas include a stroboscopic flow meter; a gravity recorder using the dangling-chain balancing system of the chain analytical balance; a continuous recorder for index of refraction, which can be used as a measure of composition; and a direct analyzer for sulphur compounds in gases.

Postwar availability of radioactive elements has had its influence on instrumentation. Radiating materials are now measuring liquid level in tanks, thickness of pipe and tank walls, and thickness of rapidly moving web materials.



New HCl Rectifier

Unit is unique: switches from one HCl

ALFRED LIPPMAN, Jr.

Commercial muriatic acid commonly is distilled or rectified to produce (1) C.P. hydrochloric acid, or (2) dry HCl gas, which sometimes is subsequently dissolved to form (3) a solution of the gas in aqueous or other media. From the operation of its muriatic acid and salt cake plant at Weeks, La., Bay Chemical Co. derives a 20 Be. muriatic acid, and this is being converted as desired into any one of these three products by a simple adjustment of valves in a recently designed, flexible unit. Conversion is done in a vertical shell-and-tube boiler directly surmounted by a packed column equipped with distributors for feed acid and for reflux, and by a condenser and a cooler-absorber, both of the cascade type.

KARBATE—AND WHY

As in any case where highly corrosive chemicals are involved, careful attention was given to the choice of a material of construction for this unit, particularly since materials which will resist hydrochloric acid in all concentrations and at the temperature necessary for the operation are not too plentiful. Exhaustive examination has been carried on for 15 years at the plant to determine the useful qualities of most of the materials commonly employed for hydrochloric acid service, including chemical stoneware, porcelain, borosilicate glass, fused silica, tantalum, hard rubber, Saran or vinylidene chloride, Haveg 41 and 60, carbon, graphite and Karbate (*Trans.* Louisiana Eng. Soc., June 1946). Of all construction materials resistant to severe corrosion, only tantalum and Karbate (National Carbon Co.'s impervious graphite) are capable of providing

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◀TO MAKE C.P. HYDROCHLORIC ACID

Feed acid is adjusted to yield a condensate of the desired HCl concentration, usually 35.5-37.0 percent HCl by weight, and a depleted acid of close to 21 percent HCl. Valve *B* would be open and valve *C* closed. Non-condensable gas flows through and is discharged at the top of the cooler-absorber (valve *F* closed). Application of a small volume of cooling water over the cooler-absorber condenses out a little strong acid which flows to the separation block, through valve *D* (valve *E* closed) to join principal stream of C.P. acid product.

◀TO MAKE DRY HCl GAS

Feed acid is adjusted so that gas of the desired aqueous content (as low as 0.07 percent water) is evolved from the cooler-absorber, and a 21 percent HCl acid from the boiler. Valve settings on the condenser and the cooler-absorber system are the same as for manufacture of C.P. acid except that valve *C* is opened and valve *B* closed, so that all condensate returns to the column through valve *C* as reflux.

◀TO MAKE HCl SOLUTIONS

Dry HCl gas may be dissolved in the cooler-absorber by any solvent to which impervious graphite is immune. Valve *F* regulates flow of solvent. During such an operation, valve *D* is closed so that solvent fortified with HCl is discharged through valve *E*. Reflux is produced only in the condenser and enters the column through valve *C*, with valve *B* closed.

Can Make C. P. Acid, Dry Gas, Solutions

product to another by simple adjustment of valves (captions at bottom of page tell how)

over-all high heat transfer coefficients comparable to those obtainable with steel, and the impervious graphite is the less costly of the two. It is also unusually easy to cement, shape or machine, which is an advantage for maintenance or for changes in design after installation, which may be found ultimately necessary.

Karbate was chosen as the construction material for these reasons, and also because of its previous successful use in this plant (*Chem. & Met.*, March 1945) to increase plant capacity for dissolving hydrogen chloride and to produce 20 Be. instead of 18 Be. muriatic acid from dilute 7-12 percent HCl gases.

HOW UNIT WORKS

Strong 31.5 percent HCl acid is fed into the column, at the intermediate location shown on the drawing, through a perforated feed distributor pipe with holes so spaced as to spray 15 streams of acid at the centers of 15 equal areas of a grid plate 6 in. below. Feed acid becomes depleted of hydrogen chloride as it descends the column (packed with 1-in. Berl saddles) in contact with vapors which become increasingly rich in HCl as they ascend the column from the boiler at the base of the column, a typical rectification. Constant-boiling (depleted) 21 percent HCl liquid acid falls into the unpacked bottom section of the column above the top tube sheet of the boiler. From there it flows either through an external downcomer to be vaporized in the boiler or through an overflow pipe to be discharged from the column. The Karbate column is split horizontally near its middle, gasketed, and held together by spring loading; this avoids possible difficulties from expansion or contraction.

The vertical boiler is a steel shell within which is mounted a heat-exchanger assembly. This consists of 15 tubes of Karbate cemented to top and bottom tube sheets, with floating bottom head clamped to the bottom tube sheet, all of the same material. An external insulated downcomer runs from immediately above the top tube sheet to the bottom head of the boiler; space within the shell is thus used for active boiler tubes. A small tube connects the top of the downcomer with the column to prevent vapor-binding of the downcomer.

The overflow pipe, located in the column slightly below the top of the boiler tubes but above the downcomer port, permits retention of a virtually constant level of depleted acid above the top tube sheet, irrespective of operating pressure within the column, since acid reaching the level of the overflow pipe flows freely down it and out of the column. The overflow pipe is vented to the column by a small tube to prevent vapor lock.

The overflow pipe extends downward into and nearly to the bottom of a standpipe of larger diameter, sealed at the base and vented to atmosphere at the top. Depleted acid accumulates in the standpipe, then flows through the overflow pipe located about ten inches below the top of the standpipe, thence to the main acid plant where hydrogen chloride gases from the salt cake plant are absorbed to bring the acid back to 31.5 percent HCl strength.

A positive acid seal between column and atmosphere is always assured because the vertical distance between the standpipe overflow and the bottom of the overflow pipe from the column, shown as X on the drawing, is several times the maximum pressure drop through the equipment surmounting the boiler.

In the column above the feed distributor pipe, there is a short 10-in. section packed with Fiberglas No. 8 at density of 5 lb. per cu. ft., topped by a grid plate upon which reflux acid may be dripped uniformly through the reflux distributor pipe designed similarly to the feed acid distributor pipe but with smaller holes. The Fiberglas packing serves not only to provide good contact between reflux and rising vapors, for further enrichment of the latter, but also for removal of any droplets of feed acid which may become entrained in the vapor stream. The Fiberglas-packed section therefore serves for mist-depletion and vapor-enrichment.

Enriched vapors leaving the top of the column enter the condenser, a cascade-type Karbate heat exchanger. Gas and condensate discharged from the condenser are separated from each other in the condenser gas-liquid separation block; liquid, which may be either reflux or C.P. acid product, flows through either valve *C* or valve *B*, respectively. Gas from the condenser block, which may be hydrogen chloride or non-condensable, passes through the mist-trap tower packed with ¼-in. Berl saddles, to the cooler-absorber via the latter's gas-liquid separation block.

OPERATING DATA

In a representative run for manufacture of C.P. hydrochloric acid, 409 lb. per hr. of steam was employed at 50 psig. (298 deg. F.) with a feed of 605 lb. per hr. of 20.0 Be. muriatic acid (0.20 percent SO_3 and 31.08 percent HCl) which entered the tower at 91 deg. F. The temperature was 218 deg. F. at the top of the column and the vapor entered the condenser at that temperature. Product in the amount of 410 lb. per hr. of 22.4 Be. C.P. hydrochloric acid (35.97 percent HCl) was withdrawn from the condenser at 109 deg. F. Depleted waste acid in the amount of 195 lb. per hr. of 14.0 Be. muriatic acid (0.61 percent SO_3 and 20.04 percent HCl) was drawn off at 220 deg. F. and returned to the acid plant. Condenser water (132 gpm.) entered at 85 deg. F. and left at 90 deg. F. for a total heat exchange of 330,000 Btu. per hr. in the condenser. The over-all coefficient of heat transfer in the boiler from steam to boiling acid (298 to 220 deg. F.) was 421 Btu./(hr., deg. F., sq. ft. mean tube area).

In a representative run for the production of dry HCl gas, 326.8 lb. per hr. of steam was used at 40 psig. with a feed of 1,357 lb. per hr. of 20-Be. acid. From the reflux condenser, 83.5 lb. per hr. of 39 percent HCl discharged at 94 deg. F. Product gas was discharged at the rate of 160 lb. per hr. at 80 deg. F., with cooling water at 72 deg. F. inlet temperature over the cooler-absorber. The 99.81 percent HCl gas contained 0.19 percent moisture by weight. Water temperature of approximately 40 deg. F. would have reduced moisture to about 0.07 percent.

The flexibility of this equipment is evidenced by the dual use of the condenser which can act either as a straight condenser for making C.P. hydrochloric acid or as a reflux condenser for making the dry gas; the cooler-absorber may be used to supplement the straight condenser for making distilled C.P. acid, as a cooler-condenser to reduce the aqueous content of dry gas or as an absorber for the solution in aqueous or other media, of the gas produced.

Storage Capacity Of Long Pipelines

Correction factors supplied by this chart and one in a previous article (August, p. 130) are used in the author's attack on the problem of calculating storage capacity of natural gas pipelines

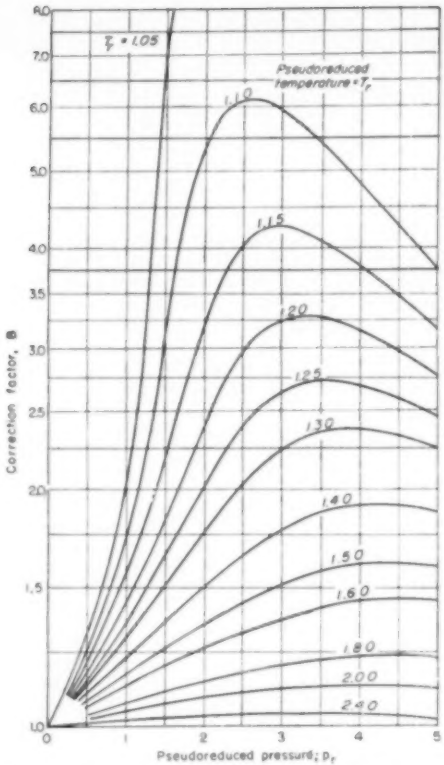

Fig. 1—Factor B compensates for non-ideal behavior.

JOSEPH JOFFE

While the primary function of a natural gas pipeline is that of a conduit for the gas, an important secondary function is that of a storage holder. With a constant supply of gas to the pipeline, the contents fluctuate depending on the rate of withdrawal of gas. During that portion of the daily cycle when demand exceeds supply, the pressure at the discharge end of the line drops to a minimum, and the line is said to be unpacked. During the corresponding portion of the cycle when the pressure at the discharge end of the line is at a maximum, the line is said to be packed.

It was pointed out by Weymouth[1] that the storage capacity of a gas pipeline is the difference between the contents under packed and unpacked conditions. For the purpose of computing the storage capacity, Weymouth derived a formula for the quantity of gas present in a horizontal pipeline under conditions of steady isothermal flow and on the assumption that the gas is ideal. Weymouth's formula may be written in the form:

$$V_s = 2\,ALT_s\,(p_1^2 - p_2^2)/3p_sT \times (p_1^2 - p_2^2) \qquad (1)$$

In modern high-pressure natural gas lines deviations from the ideal gas law are sufficiently large to require modification of Weymouth's formula. The equation of state of a real gas may be written as $pv = zRT/M$. If a constant average value, z_m, is assigned to the compressibility factor, z, of the gas in the pipeline, the following formula may be derived in a manner analogous to Weymouth's formula:

$$V_s = 2AL z_m T_s\,(p_1^2 - p_2^2)/3z_m p_s T \times (p_1^2 - p_2^2) \qquad (2)$$

This is essentially the expression given by Miller[2] for calculating the quantity of gas in a line. While it is an improvement on the ideal gas formula of Weymouth, it suffers from the defect that the assumption of a constant value for the compressibility factor, z, introduces an undetermined error into the result when the percentage variation in z from one end of the pipeline to the other is large.

METHOD

Below is presented a method for computing the contents of a natural gas pipeline under conditions of steady isothermal flow but without the additional assumption that the gas is ideal or that its compressibility factor is constant along the line. Advantage is taken of the fact that to a good approximation the compressibility factor of a natural gas is a function of only its pseudoreduced temperature and pseudoreduced pressure.[3]

Consider an infinitesimal length of pipe, dL. If the internal cross-sectional area of the pipe is A, the volume of gas contained in this length is AdL. Let the mass of gas in this vol-

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NOMENCLATURE

A = Internal cross-sectional area of pipe, sq. ft.
B = Dimensionless correction factor for non-ideal gases.
D = Internal diameter of pipe, ft.
d = Differential.
F = Dimensionless correction factor for isothermal flow of non-ideal gases.
f = Fanning friction factor.
G = Mass velocity, lb./(sec.) (sq. ft.)
g_c = Conversion factor = 32.17 (lb. mass)/(lb. force) (ft./sec.^{2}).
L = Length of pipeline, ft.
M = Average molecular weight of gas.
m = Mass of gas in pipeline, lb.
p = Pressure of gas, psia.
R = Universal gas constant.
T = Temperature, deg. R.
V = Total volume of gas in pipeline, cu. ft.
v = Specific volume of gas, cu. ft./lb.
z = Compressibility factor.

SUBSCRIPTS

1 refers to inlet conditions.
2 refers to outlet conditions.
m refers to mean value.
o refers to standard conditions.
r refers to pseudoreduced value.

ume be dm. There follows the relation:

$$dm = A dL/v \tag{3}$$

In accordance with the gas law,

$$v = zRT/pM \tag{4}$$

Substituting Eq. (4) into Eq. (3),

$$dm = (pMA/zRT)dL \tag{5}$$

For isothermal flow of gases in long horizontal pipes the mechanical energy balance may be written[4]

$$-dp/v = (2fG^2/g_cD)\,dL \tag{6}$$

since the kinetic energy term is negligible. Eliminating v and dL from Eqs. (4), (5), and (6), there follows:

$$dm = -\frac{(M^2Ag_cD/2R^2T^2fG^2) \times}{(p^2/z^2)\,dp} \tag{7}$$

The friction factor, f, varies slightly from one end of the pipeline to the other, because of the effect of pressure on viscosity and hence on the Reynolds number. However, a satisfactory approximation is obtained if a constant mean value, f_m, is assigned to f, whereupon Eq. (7) may be written in the integrated form:

$$m = (M^2Ag_cD/2R^2T^2f_mG^2) \times \int_{p_2}^{p_1} (p^2/z^2)dp \tag{8}$$

where m is the total mass of gas present in the pipeline.

For an ideal gas $z = 1$ and the integral, $\int_o^p (p^2/z^2)dp$, has the value $p^3/3$. The ratio of the value of the integral for a real gas to the ideal gas value may be termed a correction factor, B. The latter is conveniently defined in terms of the pseudoreduced pressure of the gas:

$$B = (3/p_r^3)\int_o^{p_r} (p_r^2/z^2)\,dp_r \tag{9}$$

B, like z, is a function of the pseudoreduced temperature and pressure of the natural gas. Fig. 1 is a generalized plot of B against pseudoreduced pressure at various pseudoreduced temperatures, prepared by numerical integration of Eq. (9) with the aid of a generalized z-chart for natural gases.[5] Employing the correction factor B, Eq. (8) may be written:

$$m = (M^2Ag_cD/6R^2T^2f_mG^2) \times (B_1p_1^3 - B_2p_2^3) \tag{10}$$

in which B_1 and B_2 are the values of B at the respective pressures p_1 and p_2.

For the steady isothermal flow of an ideal gas in a long horizontal pipe there exists the relation,[6]

$$p_1^2 - p_2^2 = 4RTf_mG^2L/Mg_cD \tag{11}$$

The author has recently proposed an analogous relation for real gases,[7]

$$F_1p_1^2 - F_2p_2^2 = 4RTf_mG^2L/Mg_cD \tag{12}$$

in which F_1 and F_2 are values of F corresponding respectively to the pressures p_1 and p_2. F is a correction factor for isothermal flow of non-ideal gases and is defined by the equation:

$$F = (2/p_r^2)\int_o^{p_r} (p_r/z)\,dp_r \tag{13}$$

As previously pointed out, in the case of natural gases F is a function of the pseudoreduced temperature and pressure. A generalized plot of F against pseudoreduced pressure at various pseudoreduced temperatures was obtained with the aid of a generalized z-chart for natural gases.[7] This plot (Fig. 2) was previously published (*Chem. Eng.*, Aug. 1949, p. 130).

Combining Eqs. (10) and (12):

$$m = (2MAL/3RT)\,(B_1p_1^3 - B_2p_2^3)/(F_1p_1^2 - F_2p_2^2) \tag{14}$$

The quantity of gas in the line may also be expressed as the volume, V_o, at standard conditions. In terms of V_o Eq. (14) becomes:

$$V_o = (2ALz_oT_o/3p_oT)\,(B_1p_1^3 - B_2p_2^3)/(F_1p_1^2 - F_2p_2^2) \tag{15}$$

The proposed method consists in computing the quantity of gas in the line with the aid of Eq. (15) and Figs. 1 and 2. If the gas is ideal, z_o, B_1, B_2, F_1, and F_2 are all unity, and Eq. (15) reduces to Weymouth's formula, Eq. (1). For the hypothetical case of a constant compressibility factor z_m, $B_1 = B_2 = 1/z_m^2$ and $F_1 = F_2 = 1/z_m$, whereupon Eq. (15) reduces to Eq. (2). Since Eq. (15) is not based on the assumption of a constant compressibility factor, it may be used with greater confidence than Eq. (2).

EXAMPLE

A 100-mi. pipeline having an internal diameter of 13.375 in. carries natural gas of the following composition in mol percent: methane = 75, ethane = 21, and propane = 4. The temperature of the flowing gas is 40 deg. F. The pressure at the beginning of the pipeline is maintained at 1,300 psia. The pressure at the end of the line is 300 psia. when the line is unpacked and 1,000 psia. when the line is packed. Calculate the storage capacity of the line in cubic feet of gas measured at 60 deg. F. and 14.65 psia.

SOLUTION

The pseudocritical constants of the gas are computed as molal averages of the critical constants of the components. The pseudoreduced temperature of the gas, which is the ratio of the absolute temperature of the flowing gas to the pseudocritical temperature, is found to be 1.25. The pseudoreduced pressures corresponding to 1,300, 1,000, and 300 psia. are respectively 1.917, 1.474, and 0.422. For unpacked conditions, from Fig. 1 $B_1 = 1.945$ and $B_2 = 1.125$, from Fig. 2 $F_1 = 1.338$ and $F_2 = 1.052$. The compressibility factor of the gas at standard conditions, z_o, may be taken as 1. Substituting in Eq. (15),

$$V_o = [2 \times 0.9757 \times 528{,}000 \times 1 \times 520/3 \times 14.65 \times 500] \times [1.945\,(1{,}300)^3 - 1.125\,(300)^3]/[1.338\,(1{,}300)^2 - 1.052\,(300)^2] = 47{,}750{,}000 \text{ cu. ft.}$$

For packed conditions, from Fig. 1 $B_1 = 1.945$ and $B_2 = 1.623$, from Fig. 2 $F_1 = 1.338$ and $F_2 = 1.235$. Substituting in Eq. (15), $V_o = 62{,}960{,}000$ cu.ft. Accordingly, under specified conditions the storage capacity of the line is the difference in the values of V_o or 15,210,000 cu.ft.

If Eq. (2) is used and z_m is taken in each case as the arithmetic mean of the values of z at inlet and outlet conditions, the storage capacity is found to be 19,980,000 cu.ft., a deviation of 31 percent from the previously computed value. If z_m is assumed to be the value of z at the mean line pressure, p_m, defined by the equation,

$$p_m = 2(p_1^3 - p_2^3)/3(p_1^2 - p_2^2) \tag{16}$$

and Eq. (2) is employed, the storage capacity is found to be 18,720,000 cu.ft., a deviation of 23 percent from the value computed with the aid of Eq. (15).

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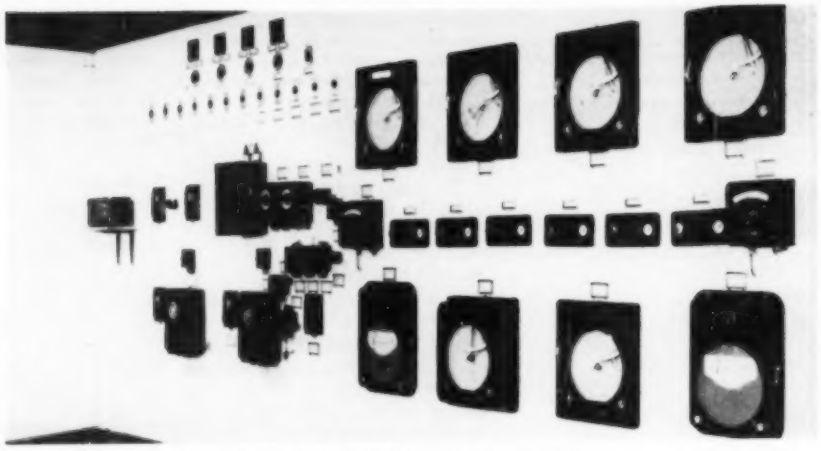

Panel board for a small continuous robotized plant making a specialty chemical.

Robotization of Process Plants

Here is a method of cost reduction the possibilities of which have barely been scratched—the development of the fully automatic, push-button process plant

A. BROTHMAN and R. V. RAMANI

NOTE: *This is the first of two articles on fully automatic plants for chemical processing. The senior author has already built two such plants and has four more under construction. This first article discusses the economics and design problems, while the second, in an early issue, will detail the design for a batch type robot plant to make synthetic resin adhesives.*—EDITOR.

CHEMICAL industry today is faced with a growing complexity of problems occasioned both by the increasing cost of skilled labor and by the steadily expanding intricacy of modern chemical processing methods. One successful solution to both problems is to design plants for completely automatic operation, using a "robot" nerve center which takes the control functions out of human hands. For this reason, a system of "robotization" has been evolved. Such a system, of course, cannot be a complete exposition of the method for making any type of process completely automatic. Instead, it is a philosophy of approach which can be applied, without qualification, to any type of processing problem that may be met in process industries.

Robotization consists in the application of automatic control instrumentation to all necessary portions of a process, and the *interlocking* of the various control instruments by any suitable means, to the end that all operations normally carried out by the production crew are handled automatically in a predetermined pattern. Note particularly the use of the word "interlocking," for it spells the difference between automatic control in the ordinary sense and robotization, which is automatic control carried to its ultimate extent.

From this definition, it can be seen that a robotized plant discharges all the functions of the production crew, including (1) control of process variables (which is the function of the automatic control instruments); (2) the sequencing of the various unit operations, and the coordination of these unit operations all around the processing cycle; and, finally, (3) checking on the processing and on the proper functioning of the automatic control instruments. The last two groups of functions are those carried out by the system of interlocks. A proper integration of the whole—instruments and interlocks—replaces costly human labor in tasks which can just as well be accomplished by a machine, freeing the man for jobs beyond the machine's capabilities.

Robotization is applicable to all types of plants and processes, batch, batch-continuous, and continuous. The more complicated the process the more advantageous and, in fact, necessary does robotization become. Although such a broad statement may be questioned, the authors know of no situation where it is untrue.

Fully automatic plants reduce product cost not alone through the reduction of direct labor, but also through the elimination of what might be called indirect labor costs. By these are meant the costs of human error

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which are inevitable with human control. A properly designed robotized plant can guarantee unvarying uniformity of processing conditions and sequences. With human operators, however, there are many shortcomings, such as incorrect batching, the incorrect carrying out of sequences, improper rate of feeding of materials, and the faulty judgment of end points of processing cycles. In addition, the human operator may make errors in the reading of instruments. He may skip certain processing sequences through fatigue, carelessness, or distraction, or fail to make proper correlations of one kind or another. When emergency conditions arise, as they often do, there must be a race between human ability to respond, and the speed with which the emergency builds up. These and other shortcomings of ordinary process operation lead to raw material wastes, excessive service costs, overloading, and consequent breakdown of equipment. They lead to high maintenance and amortization costs, unnecessarily hazardous conditions, and may consequently result in serious losses of life or property under the worst conditions. Robotization is able to eliminate all of these indirect labor costs.

One advantage of robotization which in some cases may be extremely important is that, contrary to the situation in complex conventional processes, in a robot plant vital process information need not be disclosed to highly skilled plant operators.

Although modern plants are placing more and more reliance on automatic control instruments, relieving the operator of the job of controlling process variables gives him instead the duty of supervising the automatic instruments. Since sometimes the proper functioning of these instruments cannot be readily checked, a system of robotization involving automatic checks on each control instrument is an obvious advantage. Where such checks are provided, alarms can not only indicate the exact point of trouble, but steps can be taken instantaneously to shut down the process, prevent the development of hazardous conditions, or whatever may be necessary. This effectively eliminates the argument of those non-believers in instrumentation who maintain that "one never knows when one of these gadgets gives out."

ECONOMICS OF ROBOTIZATION

In addition to the savings in over-all production costs already mentioned, robotization can often reduce the necessary capital investment. Although this statement may seem unlikely when it is first considered, there are several situations in which substantial capital savings can actually be made. For example, because of the need to pay premium wages to highly skilled labor for working irregular schedules, in many plants of conventional type it is more economical to build a larger production unit to operate on a single-shift basis, rather than a smaller unit for three-shift production. It is our experience that in practically every such case robotization makes a smaller capacity three-shift plant economically possible. In fact, robotization reduces the "economic break-point," and makes it possible to justify plants of smaller capacity than would otherwise be feasible.

Another way in which robotization tends to reduce capital costs is in eliminating additional equipment which often must be provided in conventional plants to overcome the effects of human error. Where the cost of such errors tends to be high, it is always necessary to provide equipment for reworking bad batches, or for blending sub-par material with above-par material. In molding powder plants, for example, such as those producing polystyrene, phenol-formaldehyde, and urea-formaldehyde molding powders, as well as plants for high polymer production, there is generally a substantial equipment investment in the form of storage bins and blenders which must be used to produce a mixture answering to specifications. In a typical plant of this character the cost of bins and blenders amounts to a minimum of four or five times the additional investment required for robotization. In a properly designed robot plant, such bins and blenders are unnecessary. This also means the elimination of the added labor necessary for blending.

The question may be raised as to the effect in a robotized plant of variable conditions that do not depend on human error. There may quite possibly, for example, be unavoidable variations in the composition of the raw materials. If the full range of possible raw material variations is known in advance, it is entirely feasible to anticipate these variations and build necessary corrections into the robotized plant. It cannot be emphasized too strongly, however, that the design of a robot plant requires the fullest possible knowledge of the process and of the variables that may exist. Generally speaking, this knowledge must be much more thorough than is ordinarily required in conventional plant design where many of the problems can be resolved during the initial period of "working out the bugs," while others can be taken care by the personnel as they arise.

Sometimes robotization becomes desirable not only because of cost savings, but because it makes a process possible. High-pressure and high-temperature processes are attaining new prominence, and these, together with new catalytic methods coming into use, are tending to speed up chemical phenomena and increase very materially the difficulty of achieving the necessary coordination and sequencing of the various process steps. There is a limit to the speed with which such coordination and sequencing can be accomplished by conventional combinations of automatic instrumentation and human operation. Beyond this limit only robotization can do the job.

ROBOTIZATION COSTS

What does it cost to run a robotized plant? The cost can be broken down into amortization cost of the system; service costs for power, air and the like used by the instruments and interlocks; and maintenance cost. The last two are small compared with the first. Amortization cost naturally depends on the initial capital outlay involved, the useful life of the system, and the capacity of the plant.

The capital cost for the additional equipment necessary to robotize any process naturally depends on the type and intricacy of the process itself, the accuracy of control necessary, and the quantity of automatic instrumentation required over that which ordinarily would be used. Practically all modern process plants in the United States employ a substantial degree of instrumentation, so that robotization frequently adds little more than the cost of an interlock system. In the case of a number of small production process plants involving a comparatively high degree of intricacy, the total cost of robotization ran between 10 and 15 percent of the total plant cost. However, this figure included 7 to 10 percent of plant cost for process control instruments, most of which would have been required anyway, and only 3 to 5 percent for interlocks. For larger production units of the same type, the percentages for instrumentation and interlocks would have been substantially less.

The figure given here for interlocks applies primarily to batch and batch-continuous plants. In the case of continuous plants it tends to run much lower. In one actual continuous plant the total installed plant cost, ready to run, was $187,550. The installed cost of all instrumentation and interlocks amounted to $18,450,

or 9.8 percent of total plant cost of which about 9 percent covered instruments and controlled valves, and about 0.8 percent, interlocks. Before-installation costs of the instrumentation included $8,396 for instruments, $5,840 for pneumatic and solenoid controlled valves, and $968 for the interlocks. Because of the complexity of wiring required, installed cost of the interlocks was about 160 percent, and installed cost of the instruments and valves, about 120 percent of uninstalled cost.

The effect on labor needs of this last installation is interesting. Robotization reduced the labor requirement per shift from 14 men for a conventional set-up, to one actual attendant at the panel board, and another man who had the dual capacity of maintenance man and assistant to the attendant.

In another case, involving batch operations, an existing plant was robotized after having been shut down for several years because its production cost of $0.42 per pound almost exactly equalled the selling price of the product. Here high labor cost, varying yields and hazardous working conditions conspired to defeat an otherwise promising process. In addition to instruments and interlocks the plant required a small amount of rearrangement of the existing equipment which was prorated to the installed cost of the improvements added. The total cost of changes came to $10,879 for instruments, $3,072 for automatic valves, and $2,089 for interlocks. The result was to reduce labor, improve yields and product uniformity, and largely remove the hazard. Production cost has been reduced so as to yield a $0.17 per pound profit.

The second of the cost factors bearing on amortization of a robot system is the useful life of the equipment. Most of the instruments and practically all of the interlocks are never directly subjected to the severe processing conditions met by the plant equipment. Therefore, the robot system will generally outlast the plant equipment which it controls. Its amortization cost can therefore be taken over a longer period than that usually allowed for the processing equipment. It is safe to say that in most cases amortization can be spread over a minimum of 7½ years under the worst conditions, and 15 years, under the best.

When a robot system is superimposed on an already existing plant of modern character it is generally unnecessary to add much additional control instrumentation so that the changeover seldom involves much more than the cost of the interlocks between instruments that have already been provided.

Although it is true in general that the largest savings, percentagewise, come from the robotization of small plants, it will be interesting to note the figures applying to a medium-size production unit with which we have had experience. In this case the cost of robotization, including all of the necessary automatic control instruments as well as the interlocks, amounted to about 8 percent of installed plant cost. Writing off the robot system on a five-year basis gave an amortization cost of $0.003 per pound of product. Before robotization the labor cost per pound was $0.055. The cost for power and services on the robot system, including its maintenance, came to $0.0003 per pound. Thus, the cost of robot operation was $0.0033 per pound in comparison with the former labor cost of $0.055, which represented a very substantial saving in the earlier overall production cost of $0.40 per pound. This saving, in fact, permitted the direct capital outlay for the robot system to be retrieved in less than nine month's operation, considering only savings in labor cost. This took no consideration at all of the savings resulting from elimination of human error factors and the improvement of day-to-day yield and quality variations which the robot system made possible.

In another case labor cost amounted to a much higher percentage of total manufacturing cost, 37½ percent. Before the plant was robotized labor came to $0.0375 per pound. After robotization the comparable cost was $0.003 per pound, or 3 percent, which included necessary attendance and the maintenance, amortization and costs for power and services for the instruments and interlocks.

What effect may be expected when a plant is forced to operate at reduced production levels? In conventional plants, reduced operating levels seldom permit the elimination of a proportionate amount of highly skilled labor required for operation. This means that labor cost becomes a greater factor and production cost rises proportionately. While it is true that amortization costs go on despite reduced operation in robot systems, the amount involved is small and the adverse effect on production cost is much less than in conventional plants.

DESIGN CONSIDERATIONS—THE PROCESS

Before we consider the approaches and techniques involved in placing a process plant under fully automatic, robotized control, it is necessary to glance at the scope of the problem from a process engineering viewpoint. No matter how complex a plant may be, and no matter whether it be batch, batch-continuous or fully continuous, all of the major production steps can be broken down into elementary unit operations, each of which can be controlled individually by one or more automatic control instruments. Nowadays most well designed plants are actually using automatic control for many if not most of the individual unit operations. The problem then becomes one of tying together all of the individually controlled steps into a general pattern of processing. This is what the plant operator does. Putting his own brain to work, he coordinates the individual steps. In robotization we substitute a mechanical, electrical or electronic "brain."

As a general proposition, let it be noted that robotization involves generally three types of functions: coordination between the various unit operations; time sequencing between these operations; and automatic checking on the working of the crucial process controllers, so as to give warning in case of failure, and to bring about whatever action is necessary to prevent hazard and waste.

Probably the simplest type of robotization is that involved in a batch type plant involving a single, main process step. This step will, however, usually include several unit operations which must, of course, be coordinated and time sequenced. A more complicated problem arises in a batchwise plant utilizing more than one major process step. In such a case it is not only necessary to robotize each of the unit steps through the interweaving of their various unit operations into an overall production pattern, but it is also necessary similarly to tie together the several major steps.

A still further degree of complexity, although usually not an exceptionally difficult problem, occurs with the pure batch plant which is used alternatively for several different products. In this case, which is frequently met, the processing conditions usually vary for the different products manufactured, and some steps in fact may even be omitted or added for the different products. Such a case requires rather comprehensive switching arrangements among the various interlocking members and control instruments. However, it is still possible to devise robot systems for such cases without excessive expense. This comes from the fact that, after all, the scope of any installation is relatively fixed by the units which comprise the installation. Hence, to achieve a multi-pur-

pose robot system, it is merely necessary to devise a system of switching arrangements in the interlocks by which the automatic control instruments serving each of the unit operations are grouped into alternative coordination and sequence patterns.

A rather different series of problems is involved in robotizing a fully continuous plant. In this case it is necessary to establish coordination and time sequences between the various unit operations carried out in each major piece of continuous operation equipment. Each must be brought from start-up to steady-state conditions, hold equilibrium coordinations during steady-state normal operation, and then permit shutting down at the end of the operating cycle in an orderly fashion. Furthermore, each step must be brought into proper relation and time sequence with other continuously operating steps to achieve a smooth overall production pattern.

From the process engineering viewpoint the robotization of a batch-continuous plant tends to offer more problems than do either batch or continuous plants individually. This comes principally from the intricacies involved in interlocking the batchwise with the continuous processing steps. A batch-continuous plant partakes of characteristics of both the individual types. Several major processing steps will generally be encountered, some on a batch and some on a continuous basis. Here it is necessary to treat the batchwise sections just as multi-step batch plants are treated, while the necessary coordinations must be effected between the unit operations in the continuous portions of the process to enable them to start up, reach steady state, run under steady state, and then shut down properly. Added, however, is the problem of coordinating and achieving proper sequence between the batchwise operating sections and the continuous steps. Here, again, the solution lies in interlocks.

It will be apparent that, whatever type of plant is involved, the development of a robotized system demands a detailed coordination of a sound knowledge of chemistry, physical chemistry, unit operations theory, principles of instrumentation, and process equipment design. Usually, too, it brings in the elements of electrical and electronic engineering.

DESIGN CONSIDERATIONS—INSTRUMENTATION

Although no exact procedures can be established for robotizing every kind of plant, it is possible to set down certain general principles. Our consideration thus far of the process engineering problems encountered enables us to make a general approach to the requirements from the instrument engineering viewpoint.

Factors affecting the choice of instruments and interlocks for a completely automatic plant differ considerably from the considerations which determine choice of control instruments required for isolated automatic control applications. This is because the objectives of the two are not identical. Automatic control in the usual sense is intended to relieve the operator of the need for determining variations in the process variables and making the necessary system changes to maintain the desired values and conditions. However, automatic control instruments in conventional plants are neither intended nor expected to relieve the operator of responsibility for correct manipulation of the instruments. Herein lies an important departure for the robotized plant. Since such a plant assumes operation of the automatic control instruments without human attendance or manipulation, even when a variety of values of a given process variable must be selected in proper sequence, it becomes necessary to base the choice of instruments for a robot plant on more rigorous considerations than those normally employed.

So it becomes necessary to consider rather carefully what are the requirements for instruments and interlocks used in robotization. We shall consider first the control instruments themselves.

To dig deeply into the fundamentals of instrument engineering would be beyond the scope of this article. However, we can develop a few guiding precepts. First, it is necessary to set down in advance the exact requirements to be fulfilled. We must know for example the type of instrument response required, the accuracy of the response, the character of process lags that will exist, and the extent to which instrument action must be corrected for these lags. This means that we shall have to decide between on-off instruments, and those which throttle. If load variations will be great, instruments incorporating automatic reset may be needed. Further, if excessive lags are to be expected, certain of the instruments may also require derivative action.

The cost of an automatic process control instrument naturally is affected markedly by the extent to which the instrument must accommodate itself to the factors just mentioned. Mechanical-electrical process controllers generally give an on-off type of response. Most pneumatic process controllers give a throttled response with or without such added features as automatic reset and derivative action.

Bearing in mind the limitations that must be placed on broad statements, we may say that the accuracy of response of non-indicating electrical controllers is generally in the order of 5 percent of the instrument range, while that of indicating type electrical controls is about 3 percent. Pneumatic controllers do better, usually about 1 percent of the control range, or even less. The three instrument classes have been mentioned here in the order of increasing cost.

Once the type of response characteristic needed has been determined, it becomes necessary to investigate all of the factors which will affect the response and performance of the type of instrument required. Suppose, for example, the response characteristics indicate a pneumatic type instrument. Whatever kind of sensitive element must be used for measuring any given process variable, it is necessary to consider what effect extraneous factors may have on the element. One type of spurious response to extraneous factors is the influence which ambient temperatures may have on the connecting tube running between an expansion type sensitive element and the instrument casing. It is well to note that when such extraneous factors are anticipated, in almost all cases manufacturers can provide suitable compensating features.

Another situation that must be considered and allowed for is the existence of instrument lag in starting up controllers embodying electrical or electronic elements which have a heat-up time. Such a lag is encountered wherever electronic components are involved. The situation may be aggravated in those cases where special switching arrangements are met in applying plate circuit loads.

The foregoing discussion makes it clear that the proper choice of automatic control instruments for a robot system demands a thorough consideration of the special suitability of various instrument types. Once an instrument has been properly chosen, there is the question of reliability of the instrument over a long period of use. It can be stated categorically that instruments at their present stage of development rarely fail if properly maintained and cared for. This fact does bring about a situation, however, which may have bad results. Knowledge of the reliability of the instruments may give rise to complacency on the part of the maintenance personnel who more or less take the fact

(*Continued on page 124*)

Thermodynamic Properties of

For decades, engineers working with the design of equipment to handle, compress or liquefy chlorine have felt the need for data on the thermodynamic properties of superheated chlorine. Here they are.

R. E. HULME

The need for thermodynamic data on superheated chlorine has been apparent for years. As far back as 1890 Knietsch[1] remarked about it when efforts were being made to liquefy dilute chlorine gas from the Weldon and Pechiney process. This lack of data still annoys engineers working on the design of equipment to handle, compress or liquefy chlorine.

An earlier article by Hulme and Tillman[2] gave tables and graphs on several thermodynamic functions of chlorine. It covered the saturated region and omitted entropy values. The present article gives data on both the superheat region and entropy. The superheat tables cover ranges of 10 to 400 psia and − 44 to 400 deg. F. These ranges should cover most of the region normally met with in practice.

The same data and plots used in preparing the previous paper[2] were used in the preparation of this one covering the superheat region. Volume residuals or alpha values are the basis of the tabulations rather than an equation of state. This means that correction has been applied to compensate for the residual volume not taken into account by the general equation of state, $pv \rightarrow RT$. However, these calculated values are intended to serve only until adequate P-V-T data become available to precisely fix these thermodynamic functions.

In calculating entropy values, some point of orientation is helpful. Giauque and Powell's[3] value of the entropy of saturated chlorine gas at the normal boiling point (51.56 cal./deg. C., mol) was selected for this starting point. The use of this value places the entropy scale on an absolute basis, that is, the zero entropy figure is for the element in the form of a solid at zero degrees on the absolute temperature scale. Conversion of 51.56 cal./deg. C., mol to English units gives 0.72708 Btu./lb., deg. R. which is the starting figure used in these calculations.

Entropy values at atmospheric pressure were calculated from the relation[6] $S = \int (C_p/T)\,dT$, substituting Eastman's equation[4] for C_p. Evaluation of the integral gives values, which when plotted on a temperature-entropy diagram, give the atmospheric pressure curve for the entropy of chlorine. To obtain other entropy curves for different pressures it is necessary to calculate the change of entropy with pressure, preferably at selected constant temperatures. The general equation for the change of entropy with pressure and temperature utilizing volume residuals or alpha values is as follows:[5]

$$dS = (C_p/T)\,dT - [(R/P) - (\alpha V/\alpha T)_p]dP$$

The term in brackets is the equivalent of the partial derivative of V with respect to T at constant pressure, which appears in the more common form of this equation. The first term of this equation may be evaluated as related above. The last term may be evaluated by graphical differentiation and integration. The number of calculations required are greatly reduced when the same temperatures as used in the enthalpy calculations are also used for the entropy calculations, because the same values for the partial derivatives may be used for both sets of calculations.

Using the data obtained, a temperature-entropy diagram was constructed from which the entropy at any intermediate temperature desired was read. The entropy values listed in Tables I and II were obtained by reading values from such a diagram.

Specific volumes were calculated from the equation[6]

$$V = (RT/P) - a$$

Volume residuals or alpha values were read from cross plots of the curves of alpha vs. temperature at constant pressure referred to in the previous article.[2]

The enthalpy values used were those calculated in the preparation of the previous article. Values of the enthalpy for constant pressure were plotted and smoothed to give the

(*Continued on page 127*)

Table I—Entropy of Saturated Chlorine

Temp.	Pressure	Entropy		
Deg. F. t	Psia. P	Sat. Liq. S_f	Vaporization S_{fg}	Sat. Vapor S_g
−40	11.3	0.4347	0.2966	0.7313
−30	14.4	0.4395	0.2878	0.7273
−20	18.3	0.4445	0.2789	0.7234
−10	23.0	0.4498	0.2698	0.7196
0	28.6	0.4549	0.2610	0.7159
10	35.1	0.4600	0.2524	0.7124
20	42.7	0.4647	0.2442	0.7089
30	51.2	0.4693	0.2362	0.7055
40	61.1	0.4736	0.2285	0.7021
50	72.5	0.4780	0.2209	0.6989
60	85.5	0.4821	0.2137	0.6958
70	100.1	0.4862	0.2065	0.6927
80	116.5	0.4900	0.1996	0.6896
90	134.9	0.4939	0.1925	0.6864
100	157.1	0.4975	0.1858	0.6833
110	178.0	0.5014	0.1789	0.6803
120	203.0	0.5054	0.1721	0.6775
130	230.4	0.5094	0.1653	0.6747
140	260.5	0.5130	0.1589	0.6719
150	293.3	0.5166	0.1524	0.6690
160	329.0	0.5209	0.1455	0.6664
170	363.7	0.5249	0.1393	0.6642
180	409.5	0.5302	0.1324	0.6626
190	454.6	0.5357	0.1257	0.6614
200	502.9	0.5418	0.1186	0.6604
210	554.8	0.5482	0.1116	0.6598
220	610.2	0.5550	0.1042	0.6592
230	669.3	0.5621	0.0967	0.6588
240	732.2	0.5692	0.0888	0.6580

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Superheated Chlorine

Table II—Properties of Superheated Chlorine

(Base: Solid at 0 deg. R. or −459.58 deg. F.)

Psia. (Deg. F.)		Saturated		Temperature						
		Liquid	Vapor	0°F.	50°F.	100°F.	150°F.	200°F.	300°F.	400°F.
10	V	0.01014	6.2731	6.8721	7.6411	8.4100	9.1791	9.9474	11.4746	12.9913
(−44.8)	h	99.50	225.13	230.76	236.90	243.03	249.15	255.29	267.49	279.72
	S	0.4324	0.7332	0.7456	0.7574	0.7680	0.7776	0.7859	0.8026	0.8165
14.7	V	0.01027	4.3375	4.6467	5.1806	5.7092	6.2376	6.7651	7.8020	8.8479
(−29.3)	h	103.15	226.97	230.57	236.71	242.85	248.99	255.13	267.41	279.69
	S	0.4393	0.7271	0.7345	0.7461	0.7566	0.7662	0.7751	0.7911	0.8050
20	V	0.01040	3.2714	3.3899	3.7818	4.1735	4.5602	4.9558	5.7281	6.4915
(−16.3)	h	106.20	228.33	230.37	236.51	242.64	248.81	254.97	267.33	279.66
	S	0.4471	0.7220	0.7200	0.7376	0.7480	0.7574	0.7661	0.7826	0.7965
25	V	0.01051	2.5806	2.6974	3.0101	3.3263	3.6395	3.9575	4.5788	5.1908
(−5.2)	h	108.91	229.51	230.17	236.31	242.44	248.63	254.83	267.22	279.62
	S	0.4425	0.7178	0.7191	0.7310	0.7413	0.7510	0.7598	0.7763	0.7902
30	V	0.01059	2.1998		2.4953	2.7613	3.0270	3.2918	3.8123	4.3238
(3.4)	h	110.83	230.31		236.11	242.25	248.47	254.69	267.13	279.56
	S	0.4565	0.7147		0.7258	0.7364	0.7457	0.7544	0.7712	0.7851
35	V	0.01067	1.9048		2.1278	2.3576	2.5879	2.8165	3.2646	3.7044
(11.0)	h	112.62	231.04		235.91	242.05	248.30	254.54	267.03	279.52
	S	0.4605	0.7120		0.7213	0.7317	0.7412	0.7499	0.7670	0.7800
40	V	0.01073	1.6890		1.8522	2.0551	2.2584	2.4601	2.8539	3.2400
(17.6)	h	114.22	231.65		235.71	241.85	248.12	254.39	266.94	279.48
	S	0.4636	0.7098		0.7173	0.7278	0.7373	0.7460	0.7633	0.771
45	V	0.01081	1.5264		1.6379	1.8199	2.0021	2.1828	2.5344	2.8789
(23.5)	h	115.56	232.20		235.51	241.65	247.95	254.25	266.84	279.44
	S	0.4663	0.7078		0.7139	0.7243	0.7339	0.7426	0.7590	0.7738
50	V	0.01087	1.3838		1.4664	1.6316	1.7971	1.9600	2.2787	2.5897
(29.3)	h	116.92	232.71		235.31	241.45	247.78	254.10	266.75	279.40
	S	0.4690	0.7058		0.7104	0.7210	0.7305	0.7394	0.7560	0.7708
60	V	0.01100	1.1630		1.2093	1.3491	1.4880	1.6277	1.8953	2.1560
(38.7)	h	119.36	233.60		234.73	241.09	247.46	253.84	266.60	279.35
	S	0.4736	0.7023		0.7051	0.7156	0.7253	0.7338	0.7508	0.7657
70	V	0.01109	1.0200		1.0257	1.1474	1.2692	1.3890	1.6215	1.8460
(47.2)	h	121.12	234.21		234.45	240.70	247.12	253.55	266.41	279.26
	S	0.4767	0.6997		0.7003	0.7108	0.7203	0.7291	0.7463	0.7614
80	V	0.01120	0.8993			0.9957	1.1040	1.2113	1.4159	1.6135
(56.1)	h	123.21	234.89			240.30	246.77	253.25	266.20	279.16
	S	0.4804	0.6969			0.7061	0.7161	0.7244	0.7421	0.7577
90	V	0.01130	0.8054			0.8779	0.9754	1.0721	1.2560	1.4325
(63.4)	h	124.93	235.45			239.96	246.47	252.99	266.02	279.05
	S	0.4834	0.6947			0.7027	0.7123	0.7212	0.7389	0.7546
100	V	0.01138	0.7307			0.7833	0.8724	0.9607	1.1279	1.2876
(69.9)	h	126.45	235.91			239.56	246.12	252.69	265.82	278.95
	S	0.4852	0.6924			0.6993	0.7089	0.7178	0.7357	0.7515
120	V	0.01154	0.6197			0.6416	0.7178	0.7934	0.9357	1.0700
(81.4)	h	129.21	236.74			239.03	245.64	252.26	265.49	278.73
	S	0.4904	0.6890			0.6931	0.7027	0.7118	0.7302	0.7464
140	V	0.01170	0.5324			0.5396	0.6069	0.6733	0.7981	0.9152
(92.3)	h	131.68	237.15			238.25	245.20	251.90	265.18	278.47
	S	0.4949	0.6859			0.6878	0.6974	0.7067	0.7255	0.7421
160	V	0.01184	0.4632				0.5238	0.5833	0.6948	0.7972
(102.0)	h	133.94	237.56				244.38	251.20	264.81	278.21
	S	0.4985	0.6830				0.6926	0.7021	0.7212	0.7378
180	V	0.01198	0.4192				0.4639	0.5139	0.6142	0.7039
(110.8)	h	135.83	237.75				243.65	250.80	264.44	277.93
	S	0.5016	0.6803				0.6882	0.6981	0.7177	0.7349
200	V	0.01212	0.3771				0.4067	0.4568	0.5496	0.6327
(118.6)	h	137.92	237.90				242.80	250.25	264.20	277.63
	S	0.5049	0.6780				0.6842	0.6943	0.7141	0.7319
220	V	0.01226	0.3414				0.3637	0.4100	0.4967	0.5728
(126.4)	h	139.59	237.94				241.80	249.65	263.75	277.32
	S	0.5080	0.6757				0.6809	0.6908	0.7100	0.7292
240	V	0.01239	0.3130				0.3275	0.3719	0.4522	0.5225
(133.6)	h	141.27	238.01				241.00	249.05	263.35	277.00
	S	0.5107	0.6737				0.6772	0.6873	0.7069	0.7206
260	V	0.01250	0.2882				0.2968	0.3390	0.4145	0.4798
(139.8)	h	142.70	238.13				240.08	248.30	262.94	276.67
	S	0.5130	0.6719				0.6739	0.6842	0.7042	0.7243
280	V	0.01264	0.2680				0.2703	0.3108	0.3822	0.4433
(146.0)	h	144.17	238.08				238.85	247.55	262.50	276.35
	S	0.5150	0.6700				0.6710	0.6814	0.7017	0.7221
300	V	0.01278	0.2478					0.2861	0.3540	0.4114
(152.8)	h	145.79	237.97					246.58	262.00	276.00
	S	0.5178	0.6683					0.6784	0.6992	0.7200
350	V	0.01306	0.2128					0.2362	0.2976	0.3502
(165.5)	h	148.96	237.82					244.88	260.90	275.14
	S	0.5229	0.6650					0.6723	0.6942	0.7154
400	V	0.01338	0.1851					0.1986	0.2550	0.3024
(178.3)	h	152.37	237.63					242.80	259.70	274.24
	S	0.5294	0.6630					0.6670	0.6902	0.7112

V = Specific volume as cu. ft. per lb.; h = enthalpy as Btu. per lb.; S = entropy as Btu. per lb. deg. R.

DU PONT RESEARCH AT LAST FINDS A WAY TO

LINE TANKS WITH

Sprayed plastic lining resists practically all chemicals up to 500 deg. F.

Competitive with glass-lined and rubber-lined.

At least one year, maybe more, before generally available.

E. C. FETTER

IN OUR OPINION this story breaks the news-of-the-year in the materials of construction field. More important even than the original disclosure of Teflon's creation, this newest development means that "the most inert of all plastics" can now realize its potentialities. To make a vital announcement more lively it has been cast in the form of an interview. What you read below has been developed by Managing Editor E. C. Fetter from a number of meetings and long-distance-telephone conversations with Du Pont's sales and technical representatives. It has been checked by them for reporter's errors.—EDITOR

We hear you Du Pont people have whipped the problems that have limited the applications for Teflon. That is, it's been hard to fabricate and it wouldn't adhere to anything. How about it?

It's true, all right. Understand, it's all development so far. We don't as yet have much field experience to speak of. But in the laboratory and in a few field tests we have been able to do some very important things with Teflon that we've never been able to do before.

For instance?

Well, let's see. I'd say there are six distinct things you ought to talk about when you write this up. First of all for you chemical people, there are the spray coatings; you can spray them on steel for instance and get a good, impervious film with all of Teflon's heat and corrosion resistance. Second, there are wire enamels; they are for insulating fine wire—magnet wire, for instance. Third come the extrusion compounds; you use them for electrical insulation too—when you want a thicker insulation on heavier wire than the enamel is used for; or you can use it to extrude rods and tubes and various shapes. Number four would be unsupported Teflon tape and film. And fifth, you have supported film—specifically Teflon-coated glass cloth. The sixth is raw Teflon suspensoid, the material from which the other Teflon products are made, and which we hope will have many other uses.

And each of these is new?

Every one. Take the spray coatings; up to now you couldn't spray Teflon, and even if you could it wouldn't adhere to anything. The same thing goes for wire enamels. And the extrusion compounds—also new. Sure, we extruded Teflon before, but how fast? About 6 ft. an hour. You wouldn't exactly call that commercial. Now we can extrusion-coat electric wire at anywhere up to 20 ft. a minute. And things like rods and tubes and sheets we had to make either by extrusion at impractically slow-rates, or by pressing Teflon powder into the desired shape and then sintering it to make the particles coalesce into a solid piece. Now we extrude such shapes at high speed. Unsupported film—I think we could call that new too. We've been making such film but we had to shave it off a solid rod or tube with a veneer cutter, now we can flow the Teflon onto a sheet of metal and peel off the film. And supported film—well that wasn't possible at all.

What has held these products up? Teflon has been around a long time hasn't it?

Since before the war. But we couldn't fabricate it. Look at it this way. Teflon is a thermoplastic, tetrafluoroethylene. But it doesn't act like an ordinary thermoplastic. You can't dissolve it in anything, so you can't make coatings and films the ordinary way. You can't melt it or soften it with heat to mold or extrude in the ordinary way. But Teflon does have a peculiar property that we thought might be the way out. If you heat Teflon polymer to 620 F it undergoes a transformation. Below 620 it is a crystalline solid; above, it is amorphous. If you heat Teflon powder above the transformation temperature the particles coalesce and fuse into a solid, continuous structure. So what we tried to do was this: While it was still a powder, still mobile, we tried to put it in the shape we wanted—a coating on steel, say, or around wire, or a thin film, or a shaped part—whatever the final form might be that we wanted. Then, when we had it where we wanted it, we thought we could heat it above the transformation temperature; the particles would fuse together and we'd have a continuous structure. That's what we thought would happen—but it didn't work. We couldn't get good coatings, we couldn't make it adhere, we couldn't extrude rapidly, we couldn't do anything with it—except mold it into a few simple shapes.

TEFLON

What happened to change all that? What's the trick?

Well, all this time we had been working with Teflon in the form of a granular powder. And gradually we came to suspect the trouble was particle size—too big. If we had the polymer in very fine form—extremely fine—we thought we could work with it. And then one day it happened. One of our research men was fooling around with polymerization variables . . . .

Such as?

. . . Oh—time, temperature, agitation, pH, so on. Anyway, he found that under certain conditions he got a colloidal polymer. He tried it again and thank heaven he knew what he had done and could duplicate his results. That was a big day in the life of Teflon. It gave us a new material—Teflon suspensoid.

Then the trick is minute particle size, and "suspensoid" is the key word—the big discovery. Is that it?

Yes, more or less. Suspensoids were the big first step anyway. The net results to date are the six products I gave you before.

Couldn't you have got your fine particle size by some mechanical means, pulverize it?

No. It's too bad, but we haven't so far. You have to live with the particle size that you produce in the polymerization process. Polymerize one way and you get a granular powder; another way and you get the colloidal suspensoid. As it comes from the polymerization kettle, the suspensoid looks like milk or cream. And the particles are so tiny they don't settle out.

Let's go back over your six new products now and find out how to extrude the suspensoid and spray it and . . . .

Whoa! Not so fast. You don't spray the suspensoid; you can't. Even a little agitation makes the colloidal particles agglomerate and all you would get from your spray gun would be Teflon spaghetti. And even if you could spray it, the suspensoid itself doesn't adhere to metal. You can't extrude suspensoid either, or coat wire very well. Not directly. But from the suspensoid—and I want to make this clear, because people are going to start talking about Teflon suspensoids and we don't want to get the vocabulary muddy here at the outset—from the suspensoid we produce pastes that you can extrude, coatings that you can spray and do adhere, enamels that you can coat wire with, formulations that we can use to make unsupported film, and others that we can impregnate glass cloth with. But the suspensoid itself is the raw material—and all these pastes and spray coatings and enamels and so on are all several steps removed from it. It takes special compounding and modification to make the suspensoid useful. While I'm at it I want to give our research people another plug. You remember I would only admit that suspensoids were "more-or-less" the great discovery. To my mind, finding out how to make the stuff sprayable and at the same time adherent to metal, and how to make it extrudable and so on—I think those things rate as great discoveries too.

Do you want to tell us more about that?

I don't want to tell you how to modify our suspensoid, no. Anyway the important thing to your readers is the fact that it is being done—after long, frustrating years of research—and we can at last offer for sale six new and highly useful Teflon products.

* * *

Then suppose we look into each of those products one by one. Let's start with the spray coatings. Can you use them to line tanks?

Absolutely. We think it is only a matter of time before people will talk about Teflon-lined equipment the same way they do about glass-lined or rubber-lined.

How long before Teflon-lined vessels will be available?

A year, maybe a little more. Right now we only have pilot plant capacity for the raw material, the suspensoid. We are building a new plant in Parkersburg, West Virginia, but that won't get into production until around July 1950. So until then we won't have enough material to line more than a comparatively few vessels—and even those will be more or less special, developmental jobs. Five years from now, though, Teflon-lined tanks ought to be common; you'll be able to order them as easily as you order glass or rubber-lined vessels.

Does a Teflon lining have all the corrosion resistance and heat resistance of the molded Teflon we've been using as gaskets and packing?

Yes, providing a sufficient film thickness is built up, the lining will withstand the effect of just about all known chemicals up to 500 F. Exceptions are molten alkali metals like sodium, and under certain conditions, fluorine.

I wondered, because you said you modified the suspensoid to produce the finishes. That suggests some foreign material that might be present to hurt Teflon's properties.

No, that doesn't follow. There are three types of Teflon coating—primer, intermediate and finish. They all contain other things than Teflon; but the finished built-up systems, after they are dried and fused, have all the essential chemical, heat resistant and antisticking properties of Teflon.

Maybe this is the time to find out how the lining is applied.

First you've got to get a clean surface: it's best to sand blast and wash off any grease with a solvent. Then you use ordinary paint spray equipment to apply the Teflon. It's very easy, goes on like paint. First you apply the primer coat. After it is sprayed on you let it air dry to get rid of the vehicle; or you can force dry it if you want, just so you don't heat it over 200 F. Then when the vehicle is all evaporated out you bake it at around 750 F. for a minute or so. At that temperature the individual particles fuse together and you get a continuous film. Then you let it cool down to room

temperature; or what we do is quench it with water; quenching seems to make the coating tougher. Then you apply the intermediate and finish coats the same way: spray them on, let them air dry or force dry them, and fuse at 750—each coat separately.

Is the fusing temperature critical?

No. It has to be well above the transition temperature, 620—but shouldnt go much over 750 or the Teflon will start to decompose and volatilize.

How many coats does it take all together?

That depends on the application. You will always use the primer—that's the secret of adhesion. You may or may not use an intermediate coat; its purpose is to toughen the finished lining. And finally, the number of finish coats will vary from one up to six or more.

Suppose you wanted maximum corrosion resistance, what system would you follow?

A primer 0.3 mil thick; no intermediate coat; usually four to six finish coats each 1 mil thick—each separately fused and all but the top coat lightly sanded to remove high spots and dust. The total thickness of a full four-coat system is about the same as a dollar bill. In extreme cases a much thicker film may be necessary.

That isn't very thick. Don't you have trouble with porosity?

Not if you do it right and build the film thick enough; here's a steel pan lined with Teflon that has had HCl boiling in it for hours—many hours; you can see, it didn't faze it. By the way, speaking of applying the lining properly reminds me of another point. Each transformation in the coating is accompanied by a change in appearance. When you first spray a clear finish, the film is clear; then as you dry out the vehicle it changes from clear to milky; and when you fuse it it changes again, from milky to translucent. You see what that means—you can tell by looking at it as you go along whether one operation is finished and you can go on to the next. That makes it a whole lot easier to get a good job. And that's not all. If you are all finished and you find a bad spot, you can sand down to the metal and go through the whole procedure again on just that spot. In that case you apply the heat for baking either with a blow torch or gas flame. Ordinarily when you are lining a whole tank you would bake the lining in an oven—like the kind they use to fuse in a glass lining.

That sounds like a Teflon lining can be repaired if it gets damaged mechanically in service.

It can. Easily.

In the field?

Sure. Feather off the edge of the damaged area with sandpaper. Then apply primer, dry, fuse and follow with successive coats to match the original lining. It isn't hard; I've done them in less than half an hour.

If you can do the necessary fusing with a torch or flame, why couldn't you line a whole tank in the field?

I don't know why not. We haven't got around to trying it yet but it seems entirely feasible. Remember we are still feeling our way; we are just now beginning to apply Teflon lining to some larger vessels in fabricators' shops where big ovens are available. And I imagine that's the way most Teflon linings will be put in—in the beginning anyway.

Do you know of any fabricators who have definitely decided to go into the Teflon-lining business?

Yes, several have decided to go ahead but are not set up as yet. Now look, don't you go and get us swamped under a ton of mail from people who want to know where to get a Teflon-lined tank. You can't buy one anywhere. We won't even have commercial quantities of the suspensoid until the middle of next year—remember?

How will Teflon-lined equipment compare in cost with glass or rubber-lined?

I can't give you exact costs. We don't know ourselves yet. It will compete for many services, though, don't worry about that. Right now the spray coatings sell for $65 to $85 a gallon, and one gallon covers about 300 sq. ft. with a single 1-mil. coat. If and when we can, of course, these current prices will be reduced. At the present $65 to $85 price level we figure a four-coat lining would cost ninety odd cents a square foot for materials. And my horseback guess would be that application costs might add another dollar. We'll know a lot more about costs after we've had more field experience.

Can a Teflon lining take mechanical abuse?

It's tough; you would be surprised. A Teflon lining will take more abuse than a glass lining; that's certain. Compared to a rubber lining, I don't know; not so sure. That's another one that we'll learn from our field tests.

How about adhesion to metal?

Here, look at this. Here is a panel of bright, shiny aluminum. This dark stripe across the middle is where we applied a coat of Teflon primer; it was sprayed on, dried and fused just the way I described it for you. Then over the whole surface we applied a coat of the finish coating. Now try to peel off the finish coat. You see it comes off easily where the finish coat was applied directly to the aluminum. But that stripe where the undercoat of primer was put on stops you. Now get a good hold on the sheet you've peeled up and pull hard. There, you see what happens? The film tears along the edge of the stripe but you couldn't peel the top coat loose from the primer. If you worked at it you could scrape it off with a knife but otherwise it won't come loose.

Would thermal shock loosen it or crack the coating?

Not a bit. We have never actually tried this, but I'll bet you could put Teflon lining in a service where the temperature fluctuates as rapidly as you like and as many times a day as you like between 500 and −100 F., and it wouldn't have any effect on service life. I think I mentioned that we quench the coating from around 750 F. in the process of applying it. Teflon coatings are very flexible; we have coated flat sheets of steel and stamped out lids, like the lids you see on little pint-size cans of paint. It didn't hurt the coating at all.

I guess Teflon is a thermal insulator. Does that rule out Teflon coatings for heat exchange surfaces?

No. But you probably won't get the same high heat transfer rates that you get with metals.

Will colored Teflon finishes be available?

Yes, in a variety of colors eventually. But so far we are only field testing a red, a white and a green.

What materials will the coating adhere to?

Steel, stainless steel, aluminum, brass, copper, glass (after it's been sandblasted), porcelain and brick.

What other kinds of chemical equipment are you working on besides tanks and vessels?

Quite a few, but we are still only getting started. Rupture disks look like a good one, where you want the mechanical properties of, say, aluminum foil but aluminum won't withstand the corrosive. And we've tried agitator blades—which, incidently, tells you how we feel about Teflon's erosion resistance. Valve parts are another, especially plug valves, where its antisticking quality ought to be valuable. And we are looking into pipe and fittings, and laboratory benches and hoods, and probably a few others that I can't think of offhand.

So far we have been talking about coatings only from the corrosion angle. Do they have other properties that will make applications?

Yes. Their antisticking quality will be useful as a coating for such things as cold dough conveyors in bakeries, candy molds, rubber molds, heat sealing machinery, soap packaging machinery, things like that. And I can conceive of its electrical properties—it's a good insulator—being utilized in electrolytic processes. On electroplating racks for instance or to line the plating tanks.

* * *

That ought to take care of spray coatings. Let's get on to the second of your six products—wire enamels. Are they similar to the spray coatings?

Somewhat. We use similar built up systems: primer, intermediate and finish coats.

Where are the applications for the wire enamel?

The really big one is for insulating magnet wire for the windings on motors, transformers and generators.

And the big advantage?

Heat resistance. Teflon insulation will stand a much higher temperature than ordinary insulation. A transformer insulated with Teflon can operate at 400 F instead of 220 for ordinary insulation. And a Teflon insulated motor can operate continuously at 400 F and for short periods at 500. So, if your insulation can stand higher temperatures, that means you can put more current through the conductors, and you get that much more power out of the machine. On a motor for instance, Teflon insulation would increase the horsepower output by 25 or 50 percent. Or the other way around, to get the same horsepower your motor would be greatly reduced in size and weight. A transformer would only weigh a third as much—and it would last three times as long.

What is so important about reducing size and weight?

To reduce the cost for one thing—less copper and so on, you see. Weight is important in aircraft. And a big transport plane has some 30 motors and 30 transformers in it. There are many places where space is at a premium; deep freeze motors and adding machines for example.

You speak of reducing cost. How about the cost of wire enamel?

They are currently priced at $80 to $110 a gallon. As to cost for an all-Teflon motor, it's hard to say how it would work out. Your insulation would cost a lot more—but you would save on everything else because of the reduced size. It is just barely possible that they would balance and the Teflon motor would cost no more than ordinary motors. It would be a lot better; besides standing higher temperatures, Teflon insulation keeps its electrical properties, wet or dry; and it resists solvents and chemicals the same as any other Teflon.

Is it tough?

Tough enough to wind on regular production machinery. That's what counts.

How is it applied?

On standard machines, after making a small adaptation. These wire enameling machines all have high-temperature ovens for baking the ordinary enamels, so fusing the Teflon doesn't introduce any special problem that way. With ordinary enamels the wire passes under a sheave that dips into the enamel, and then it goes up into the oven to bake. Then threading back through the enamel again under another sheave and so on back and forth between the enamel and the oven until you have built up the thickness you want. Now with Teflon wire enamel everything is the same except that you can't put the enamel in the container where the sheave turns, because the agitation would make the Teflon plate out on the sides of the trough and on the wheel. So we have a special applicator. It's just a short piece of glass tube with a rubber baby nipple pulled on over the bottom. You put the enamel in the tube. The wire passes up through the hole in the nipple, through the enamel and on up into the oven. That eliminates agitation and you have no trouble. I've installed a set of those applicators in about 30 minutes.

How fast does the wire move through the machine?

At commercial speeds, 40 or 50 ft. a minute.

* * *

That gets us to extrusion compounds, your third product. What are they used for?

The thing we are pushing right now is extrusion-coated wire, where you want a heavier insulation than you get with wire enamels. Extruded coating ranges from, say, 5 to 20 mils in thickness. There is a demand for it in high frequency work like radar and television; it has beautiful dielectric properties for h-f, very low losses. There are other applications where you want conductors that can stand high temperatures. For instance the wire in electric ranges and other appliances, thermocouple leads, aircraft ignitions. Much extrusion compound should go into large motors, transformer coils and other electrical equipment.

Any applications in chemical plants?

The extruded coating is corrosion resistant; it isn't affected by solvents or chemicals any more than any other Teflon. Then outside the wire coatings, we are impregnating asbestos with Teflon to make gaskets; they will be more resilient and won't flow under pressure the way pure Teflon does. Extruded sheets and shapes will be used in the chemical industry, too.

Could the extrusion compounds be injection molded?

I wish I could tell you. That's one of the big questions we haven't answered yet.

Getting back to extrusion-coated wire. Must the coating be dried and baked after it is extruded around the wire?

Yes. Fusion is a fundamental step in producing all these Teflon products, whether they derive from suspensoid or from the previous granular polymer. After it's in the desired physical shape it has to be heated above the transformation temperature—usually we go up to around 700 F—to make the particles fuse together. In extrusion, the heating element is built into the machine; you put wire and Teflon paste into the machine and finished coated wire comes out. The heating element is designed so it doesn't raise the temperature of the coating too suddenly. You've got to go easy until the vehicle is all driven out; it mustn't boil.

How fast does the wire move through the machine?

We've gone up to 20 ft. a minute. I wouldn't say that's the fastest possible; we haven't really pushed to see what the maximum is.

* * *

Let's talk about the next two products now, the unsupported film and the Teflon coated glass fabrics.

They will complement the wire enamels and extrusion coatings in electrical equipment. Unsupported film will be used for tape. For applications where better tear and tensile strength and resistance to creep are required, we developed this line of glass cloth impregnates. What you've really got is a sheet of Teflon reinforced with glass fabric. Then we can take these sheets—and without any bonding agent, just heat and

pressure—we can bond them to each other and build up strong laminates.

What sort of applications do you have in mind for the reinforced sheet and the laminates?

There are the electrical uses—slot liners, armature wrapping, layer insulation and so on. And we think it might make a good substitute for mica sheet in transformers and condensers. Then there are some non-electrical uses too—protective clothing, gaskets, conveyor belts, and flexible ducts for hot, corrosive gases. There are undoubtedly a lot of other applications that haven't been thought of yet. In fact that goes for all of these new Teflon products. One of the chief things we're doing now is trying to get them out as fast as we can so other people can help us find applications.

Your sixth product too? The raw suspensoid?

Absolutely. Who knows for example but what a small percentage of suspensoid might improve the milling characteristics of rubber? To develop entirely new uses of that kind we are soliciting the cooperation of research organizations in many fields other than those we've already mentioned. Raw suspensoid is available for that purpose at $10 per pound of solids; that's about $75 per gallon of suspensoid. Eventually we hope to cut that price about in half.

You will welcome inquiries, then?

Yes, but make it clear that all of this is developmental; we don't have commercial quantities of anything, and we won't have until the middle of next year when the Parkersburg plant begins turning out suspensoid. Right now everything we do is on a laboratory or small pilot plant scale. But if someone thinks he has a good application we will be glad to investigate.

I suppose, because of the high cost of Teflon products, you won't be giving much away.

Right. In fact we will even have to charge for samples. And about inquiries, it will save your readers time if they address the right department. Spray coatings, wire enamels and coated glass cloths are handled by our Fabrics and Finishes Department; for extrusion compounds, unsupported film and raw suspensoid they should come to Polychemicals.

Robotization

(*Continued from page 117*)

of proper functioning for granted. This viewpoint may lead to bad maintenance and even failure in extreme cases. More frequently, however, it results in faulty operation which goes unnoticed.

If proper maintenance is in fact practiced, and complacency avoided, failures become extremely unlikely. Still, in designing robot control systems, it is important to design a system of checks on the continued proper performance of each major process controller by means of the interlock system. This, incidentally, facilitates maintenance since it enables a faulty instrument to be discovered quickly.

This necessity for checking on the proper functioning of the automatic controls is particularly emphasized in robotized plants. In a conventional plant with automatic controls, the operator's main job is to check on the control instruments. In a robotized plant, however, this job is taken over by the automatic interlocks and the robot "brain" or nerve center. It is necessary for these checks to react unfailingly and to detect incipient failures and hazardous conditions more rapidly and accurately than is possible for a human attendant. Incidentally, in designing check systems it is always necessary to bear in mind the various emergency conditions outside plant control which may arise during operation. Such factors include power failures and adverse weather conditions. Suitable provisions must be made to counteract any disastrous consequence that might otherwise result. As a part of this theme, instruments and interlocks of the type generally known as "fail-safe" should be used liberally.

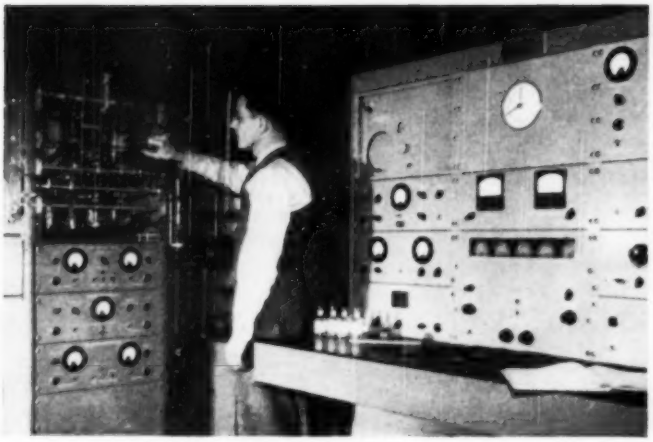
It is now possible to consider the characteristics of the interlocks which form the backbone of any robotized system. These interlocks are "slave" instruments or apparatus which do not themselves respond to or control any of the process variables. Instead, they serve as linkages between the groups of automatic controllers and responders. Sometimes they introduce the necessary time sequencing, and in other cases provide the required checking of process conditions and the response of control instruments. In still other cases they coordinate and interweave the functions of groups of instruments. It is clear, therefore, that their choice and operation is at least as important as that of the automatic instruments themselves.

A faulty interlock may conceivably upset the proper functioning of an entire process. Hence, accuracy and positiveness of response play a leading role in the choice of these devices. Uncertainty in response, or unreliable or spurious responses, can lead to unscheduled operations in the process, producing waste, possible hazard, and defeating the very purpose for which the robotization was employed in the first place. Chattering in one relay, for example, which may be a fault of the relay, or caused by imperfect contact in another, may produce weird reactions in a whole series of instruments and scramble the processing thoroughly. A timer whose contacts do not open at the preset time may lead to errors in feed, or processing, or other deviations from best processing conditions, and result in poor output or even in loss of batches. Response accuracy is most essential where the processing conditions are most critical.

Response speed is equally as important as accuracy. Sluggishness also may tangle the sequence of processing operations or even lead to hazards. Speed is especially important in those interlocks which serve as checks on the processing instruments, and their choice is largely governed by this factor. What has already been said concerning the choice of instruments applies equally to interlocks so far as their sensitivity, suitability for hazardous conditions, responsiveness to extraneous conditions, and susceptibility to failure are concerned.

One further general point must be considered. In designing the interlocks, it is necessary that they be so arranged that the system can be placed under manual control. This is necessary for those occasions when an automatic control instrument may be shut down for maintenance, or occasionally for instrument failure. It is also necessary to permit experimental alteration in process control conditions.

This discussion has reviewed the scope of the problem of robotization of process plants, as well as the design factors from both processing and instrumentation standpoints. It has, therefore, provided a basis for approaching the actual design problem. To tie down these general principles, a second article by the authors will show how fully automatic operation is achieved in the design of a plant now under construction.



BETTER QUALITY CONTROL
. . . of nitroparaffins, acetone, methanol, dimethyl ether.

IMPROVED DESIGN
. . . of columns used to separate and purify nitroparaffins.

HIGHER YIELDS
. . . of ammonia in gas synthesis plant, resulting from better control of gas compositions at various points in the system.

ACCELERATED RESEARCH
. . . on penicillin, through faster, more accurate analysis.

Commercial Solvents Likes Theirs . . . **. . . And Its Benefits**

Could You Use a Mass Spectrometer?

JAMES C. NEERMAN and ODON S. KNIGHT

Much has been written concerning the use of the mass spectrometer in analyzing hydrocarbon gases and liquid fractions which are encountered in the petroleum refining industry. Little, however, has been published about the use of the analytical mass spectrometer by purely chemical companies. It is to present some experience gained in this type of company that this report is written.

Commercial Solvents Corp. is a medium size chemical company, with gross sales about $50,000,000 per year, and approximately 2,000 employees. Major plants are located in Indiana, Illinois, and Louisiana, with the Research and Development Department located in Terre Haute, Ind. Processes operated are of two distinct types. One, depending on fermentation, produces ethyl and *n*-butyl alcohols, acetone, riboflavin, penicillin, bacitracin, and other antibiotics. The other type, depending on chemical syntheses, produces methanol, ammonia, and nitroparaffins. Various oxidation products, esters, and other derivatives of many of these primary products are manufactured.

These processes are greatly aided by the use of the mass spectrometer. Methods have been devised for analyzing quickly and accurately mixtures which could not be analyzed satisfactorily by ordinary methods. As a result, numerous benefits have been derived. *See box above.*

The mass spectrometer has enabled the nitroparaffins formed by the nitration of propane to be satisfactorily analyzed for the first time. From these analyses specifications for purity have been set up, and improved quality control put into effect.

In the commercial production of nitroparaffins, propane is nitrated under approximately 150 psig., at elevated temperatures. The unreacted raw materials are recovered, and a low boiling fraction consisting of several organic compounds is removed by distillation. The nitroparaffin fraction consists of four major compounds in approximately the following weight percentages: nitromethane 20 to 32 percent, nitroethane 8 to 13 percent, 2-nitropropane 22 to 40 percent, 1-nitropropane 18 to 25 percent, and a nitrobutane content, principally 2-nitrobutane, varying from 0.5 to 2 percent. The first four are separated and sold, having been on the market in up to tank car quantities for several years.

There are two general types of nitroparaffin production samples analyzed by the mass spectrometry laboratory. The first consists of the reaction product mentioned above, and is generally called the crude. Since the analysis by mass spectrometry for the low boiling fraction has not been worked out, it is removed by distillation. The remainder is subjected to mass spectrometer analysis. The other type of sample consists of regular nitroparaffin products—nitromethane, nitroethane, 2-nitropropane, or 1-nitropropane, in concentrations from about 90 to 99 percent by weight, the impurities in each case being principally the other nitroparaffins.

Table I gives an idea of the accuracy of the mass spectrometer when used for analyses of these nitroparaffins. Known synthetic mixtures typical of the actual mixtures

JAMES C. NEERMAN and ODON S. KNIGHT are engineers with Commercial Solvents Corp., Terre Haute, Ind.

Table I—Typical Analyses of Known Mixtures Show Reliability of Mass Spectrometer

	Percentage by weight						
	Nitro-methane	Nitro-ethane	Nitro-propane	Nitro-butane	2-Nitro-propane	1-Nitro-propane	2-Nitro-butane
Mixture 1							
Made Up	96.70	1.94	1.36				
Run A	96.75	1.87	1.4				
Run B	96.37	2.00	1.4	0.02			
Mixture 2							
Made Up	0.94	96.25	2.82				
Run A	0.81	96.36	2.74	0.09			
Run B	0.81	96.27	2.82	0.09			
Mixture 3							
Made Up	0.21	0.80			95.8	3.2	
Run A	0.21	0.79			95.7	3.3	0.19
Run B	0.21	0.77			95.5	3.4	0.16
Mixture 4							
Made Up	0.10	0.20			1.0	98.3	0.38
Run A	0.12	0.21			1.7	98.0	0.36
Run B	0.11	0.21			1.5	97.8	0.39
Mixture 5							
Made Up	11.0	18.4			29.1	39.1	2.45
Run A	10.8	18.2			30.0	38.5	2.49
Run B	10.8	18.0			29.1	39.6	2.51

Table II—Analyses of Acetone

	Mass Spectrometer		Infrared Spectrometer
	Percentage by weight		
	Methanol	Water	Methanol
Acetone A	0.22	0.12	0.2
	0.21	0.18	
Acetone B	0.00	0.08	nil
	0.01	0.07	

Table III—Impure Methanol Analyses

	Principal Components, Mol Ratios		
	Sample A	Sample B	Sample C
CH_3OH	93.4	93.6	93.1
CO_2	2.9	2.9	2.6
H_2O	3.8	3.5	4.3
C_2H_5OH	0.6	0.3	0.2

Table IV—Dimethyl Ether Fraction

	Mol Percent		
	Sample A	Sample B	Sample C
Methyl formate	9.6	9.7	9.5
Dimethyl ether	77.8	77.4	77.5
Methanol	11.5	11.7	11.5
Total	98.9	98.8	98.5
Unresolved residuals	1.1	1.2	1.5

have been analyzed and the results compared with the true compositions.

From the initial work on nitroparaffins, the use of the instrument has been expanded to include analysis of several types of liquid and gaseous samples. One type of interest concerns acetone specifications. Table II shows two analyses of two samples of acetone submitted to determine if a difference exists. The results are self-evident; Sample *B* is of better quality than *A*.

Another type of sample which has been encountered is impure methanol. In spite of the fact that entirely satisfactory apparatus and technique for handling alcohols have not been worked out, results valuable to the production department can be obtained. An example of the type of sample encountered is shown in Table III.

In one of the processes, dimethyl ether is produced in small quantities, contaminated with other solvents. Mass spectrometer analysis has been found to be the only practical way of determining the composition of these samples quickly. One type of analysis is shown in Table IV.

With the mass spectrometer furnishing accurate analyses, a thorough investigation was made of what occurs at each plate in the columns used to separate and purify the nitroparaffins with the idea of improving the design of the columns. In all, more than three hundred samples were taken from the columns and analyzed for nitromethane, nitroethane, 2-nitropropane, 1-nitropropane, and 2-nitrobutane. The effects of varying the reflux ratio and vapor velocity were studied. These have direct bearing, of course, on the number of plates required and the plate efficiency.

The nitroparaffins separated in the columns have boiling points ranging from 101.2 deg. C. to 131.6 deg. C. at 760 mm. To avoid decomposition, the columns must be operated under vacuum, which brings the boiling points even closer together. Therefore, separation is not easy, and good analyses of samples taken from the various plates cannot be obtained by ordinary methods.

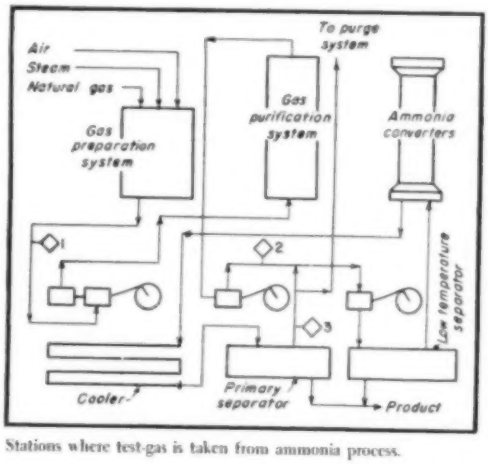
Control of gas compositions is especially important in the ammonia synthesis process for the best yields. The system is a continuous recycling one (see flowsheet). Synthesis gas is prepared by reforming natural gas with air and steam. Carbon monoxide and carbon dioxide are removed in a purification system. The active components, hydrogen and nitrogen in a 3-to-1 volume ratio, and inert components, largely methane, argon, and excess hydrogen

Table V—Synthesis Gas, Station 1

	Run A	Run B	Explosion	Catalytic
H_2	58.7	58.9	60.1	60.8
N_2	20.6	20.6	20.0	18.5
A	0.25	0.25	0.3	0.3
CH_4	2.2	2.1	1.6	2.0
CO_2	15.6	15.4	15.2	15.4
CO	2.7	2.7	2.6	3.0

Table VI—Makeup Gas, Station 2

	Run A	Run B	Explosion	Catalytic
H_2	71.8	71.7	72.0	73.1
N_2	25.1	25.2	25.7	24.2
A	0.30	0.30	0.3	0.3
CH_4	2.8	2.8	2.0	2.4
CO_2	0.02	0.04	0.0	0.0
CO	0.0	0.0	0.0	0.0
H_2/N_2	2.86	2.85	2.80	3.02



Stations where test-gas is taken from ammonia process.

or nitrogen, are introduced into the converters, ammonia being taken from them as the product. The inert components must be purged from the system as well as possible.

The critical stations are (1) where the samples of synthesis gas are taken, (2) where the makeup gas is sampled, and (3) where the recycle gas is sampled.

Table V shows the results of three different methods of analysis of a representative sample of synthesis gas at the first station.

The mass spectrometer method is more accurate and has the additional advantages of being quick and direct. Process adjustments can be made more quickly and assuredly.

Table VI shows the results of the same methods of analysis of a representative sample of gas at the second station.

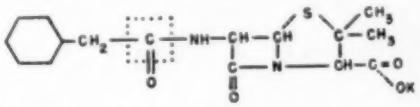
In plant operation it is desired to keep the hydrogen-to-nitrogen ratio as near to 3.00 as possible and to keep the inert materials to a minimum, since production decreases rapidly with increase in inerts. Excess hydrogen or nitrogen beyond the 3-to-1 ratio acts as inert.

In this example, the mass spectrometer and explosion methods indicate an excess of nitrogen. The catalytic method indicates the quantity is nearly correct. Variations exist in the quantity of methane and carbon dioxide reported. There is every reason to believe the results from the mass spectrometer are more accurate, since mixtures of known compositions always check very closely. When the mass spectrometer is not available, daily production figures are used to pass final judgment, but it is then too late to make adjustments for that day.

Analyses by the same three methods of a representative sample of gas from the third station show the differences among the three methods are about the same as with the other two types of gases.

Thought is being given to an instrument for continuous monitoring of a critical gas stream in the ammonia synthesis unit.

The model 21-101 mass spectrometer has proved valuable in connection with penicillin research. Senkus, Tindall, and Craig of Commercial Solvents Corp. have devised a method of determining the concentration of penicillin G in certain solutions using tagged C^{13} atoms. Potassium benzyl penicillinate containing a known atom percentage of C^{13}, as shown, is introduced in known concentration into



the solution to be analyzed. The C^{13} is finally recovered as CO_2 and the ratio of $C^{13}O_2/C^{12}O_2$ determined with the mass spectrometer. The penicillin concentration in the original solution can then be calculated. It is possible to determine penicillin G with an accuracy of ± 2 percent. No other method is available for the determination of penicillin G in impure samples with this high degree of accuracy.

Results of mass spectrometer operation have been up to expectations from the beginning. After more than two years of operation, an increasing variety of problems, particularly connected with research, is beginning to appear.

The instrument is manufactured by the Consolidated Engineering Corp., Pasadena, Calif. Operation, normal maintenance, and computing are all done by one man, whose qualifications include a bachelor's degree in chemical engineering. Since the instrument with its accessory equipment required more space than was available, a brick building 24x35 ft. was erected to house the instrument.

Superheated Chlorine

(*Continued from page 118*)

values appearing in Table II. The following additional functions for chlorine gas at atmospheric pressure are listed for the convenience of those interested in high temperature chlorinations:

Temperature	300 F.	600 F.	800 F.
Enthalpy, Btu./lb.	291.97	304.25	328.81
Entropy, Btu./lb., deg. R.	0.8178	0.8288	0.8485
Specific vol., cu.ft./lb.	9.8677	10.8967	12.9546

Table I lists the entropy values for saturated liquid and vapor for even temperature increments to correspond with the saturation table previously presented. Table II lists the properties in the superheat region for even increments of absolute pressure. The pressure increment is 5 lb. for the low pressure range and increases to 10 lb. and 20 lb. as the pressure becomes greater. It is felt that these increments are suitable for easy interpolation of intermediate values.

Since it is desirable to have some idea of the reliability of the data in a tabulation such as this, an independent check should be made. Such a check may be obtained by calculating the ratio of specific heats from the tabulated data in Table II and comparing the value so obtained with the experimental values listed in the literature. Unfortunately the experimental conditions are not always stated for the values given in the literature and one experimentor's work will not as a rule check another's. The following literature values were taken from Gmelin's *Chlor*: 1.291 Regnault (1862), 1.327 Martini (1880–1881), 1.323 Strecker (1881), 1.329 Parrington (1914).

Lange, (Gmelin's *Chlor*) gives specific heat values at 15 deg. C. from which the ratio may be calculated thus: $0.1150/0.0849 = 1.355$. The variation in the experimental values defines the limits within which our calculated value must lie.

When P-V data are plotted on log paper at constant entropy the slope of the resulting straight line is the ratio of the specific heats. Hence, the relation $\gamma = [\log (P_2/P_1)] \div [\log (V_1/V_2)]$ affords a means of obtaining an approximate check on the reliability of the tabulated functions.

For example, selecting from Table II the tabulated values for 14.7 psia. and 50 deg. F. as the initial condition and a final pressure after compression of 30 psia., a final specific volume of 3.0392 is obtained from Table II by interpolation. Inserting these values in the above equation and solving for γ gives a value of 1.3375, which is slightly higher than Parrington's value of 1.329. Since there was no direct relationship between the data used by the author in arriving at this figure and the experimental value of Parrington, this is considered to be a good check on the tabulated data for this particular range.

On the basis of the above reasoning, it is not too optimistic to believe that the tabulated thermodynamic properties are sufficiently accurate for most engineering calculations, such as compressor design and the reckoning of isentropic temperature changes when chlorine is compressed, or the down stream temperature when chlorine is throttled through control valves.

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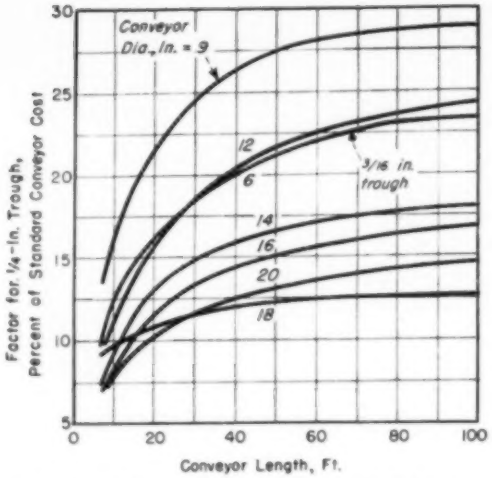
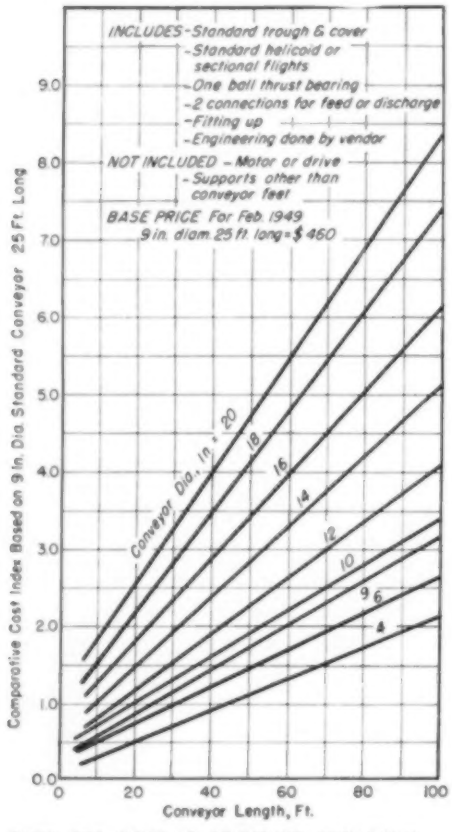
Estimate the Cost of a Screw Conveyor

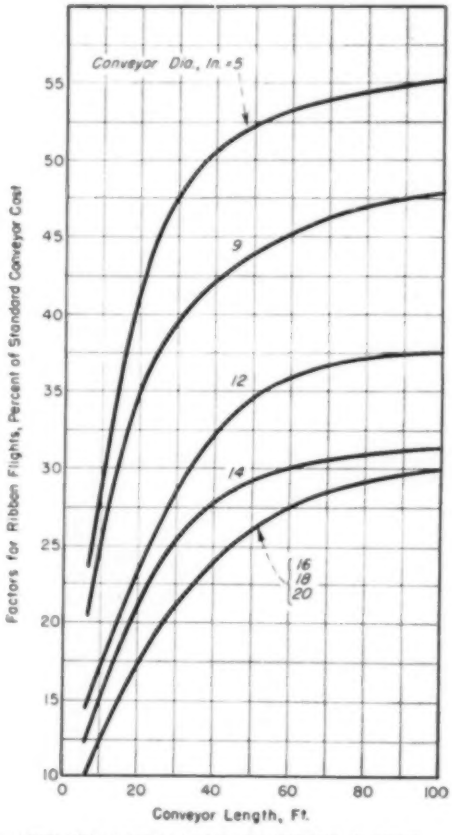
Start with cost of "standard conveyor." Then adjust for specials like ribbon flight, heavier materials, extra spouts, stainless steel.



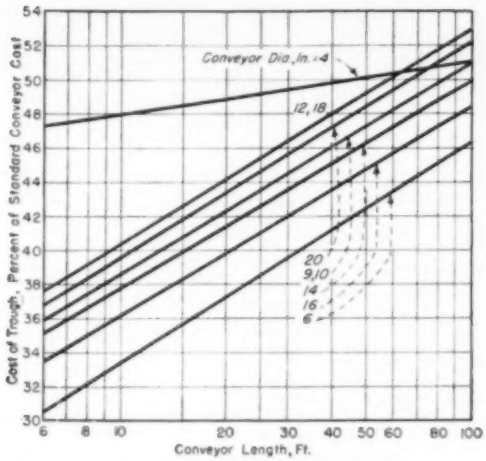
3—USED FOR EXTRA COST OF HEAVY TROUGH


INCLUDES - Standard trough & cover
- Standard helicoid or sectional flights
- One ball thrust bearing
- 2 connections for feed or discharge
- Fitting up
- Engineering done by vendor
NOT INCLUDED - Motor or drive
- Supports other than conveyor feet
BASE PRICE For Feb. 1949
9 in. diam. 25 ft. long = $460
Conveyor Dia., In. = 20
18
16
14
12
10
9
6
4
Comparative Cost Index Based on 9 In. Dia. Standard Conveyor 25 Ft. Long
Conveyor Length, Ft.

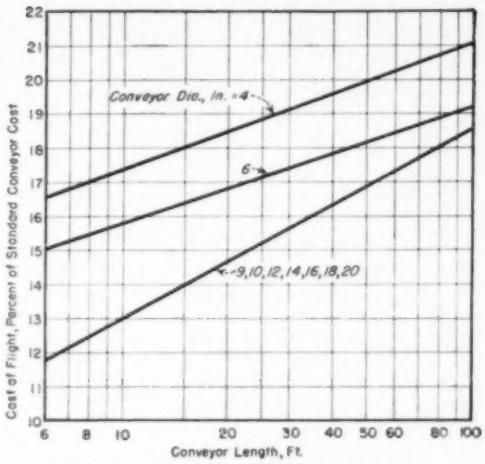
1—USED FOR COST OF STANDARD CONVEYOR



2—USED FOR EXTRA COST OF RIBBON FLIGHT



4—USED FOR COST OF STANDARD TROUGH



5—USED FOR COST OF STANDARD FLIGHT

Five charts and five tables make calculations easy. Sample problems on next page.

LYLE E. FOX

Screw conveyors vary so widely in specifications which materially affect their costs that in order to obtain estimating prices it has been necessary in most instances to use extremely rough figures on a cost per foot basis or to obtain manufacturers' quotations. Manufacturers' quotations should always be used for final estimates. However, a careful study of conveyor costs has revealed certain average trends which can be used within the accuracy usually required for preliminary estimates, particularly when you realize that conveyor quotations vary widely with different manufacturers.

Screw conveyors can be broken down into component parts, each affecting the conveyor costs in its own way. The more important of these components are the flight, the trough and the drive. Each of these components, considered separately, will provide the trends which with proper combining can be used for estimating the conveyor costs.

THE BASE-POINT CONVEYOR

Fig. 1 shows the average cost trends for standard screw conveyors. These costs are plotted as comparative costs, compared to an arbitrarily selected basic conveyor. Since the ratios of costs of different conveyors should not change appreciably over a period of time these curves and tables along with a reasonable degree of engineering judgment will provide a rapid means of estimating the cost of most screw conveyor requirements by knowing the cost of one basic unit. The cost of this basic conveyor may be adjusted from time to time by a suitable index, or it may be a recent quotation or average of quotations, or it may be calculated from a quotation on another conveyor by working backward.

A standard conveyor, for purposes of these curves and tables, includes both a standard weight commercially dust-tight steel trough and cover, and a standard-weight-helicoid, or an equivalent sectional steel flight, one feed connection and one discharge spout, one ball thrust bearing, and necessary hangers, trough ends, couplings, etc., but not including any drive, supports other than conveyor feet, or freight. (Most conveyor manufacturers' catalogs identify the flights and troughs that are considered standard. However, for convenience these trough thicknesses are tabulated here in Table I.)

The arbitrarily selected basic conveyor used for these data is a standard 9-in. screw conveyor 25 ft. long, without drive, supports, or freight. In February 1949 this conveyor cost was estimated at $460. This conveyor was set equal to 1.00 on Fig. 1 and the other conveyor curves related to this point. Any standard conveyor within the limits of these data can be read directly from the curves of Fig. 1. For example, a 16-in. steel conveyor 80 ft. long would cost 5.00 times as much as the basic unit or at $460 this is $5 \times \$460 = \$2{,}300$.

These curves do not take into account the possibility that the conveyor of given length and size will not stand the torque required for a given job. It is assumed that the engineer has already determined this by methods already available. These curves merely estimate the cost of the standard conveyor and if the standard conveyor will not fulfill the job other tables and curves will show how to adjust for costs of conveyors other than standard.

COST OF EXTRAS

Table II gives a list of factors which can be added to the standard conveyor cost to adjust for heavier flights. These factors include also the necessary cost adjustments for hangers, bearings, couplings, etc. where they are required. Because of these other items that are increased along with the flighting these factors do not vary greatly with the length of the conveyor and, therefore, are relatively constant. Factors for ribbon flights and for heavier troughs do not carry corresponding increases for other associated items and, therefore, vary with the length of the conveyor. These trends are plotted in Figs. 2 and 3. All these factors are expressed in terms of percent of cost of the standard conveyor of the same size and length. Other factors to be added to the conveyor cost where required, are shown in Table III. Since these factors

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are entirely independent of conveyor length they are expressed as percent of the basic conveyor cost; i.e., the standard 9-in. conveyor 25 ft. long. Factors have been included in these tables and curves in only enough cases to indicate the trends, and the use of engineering judgment can interpolate for the missing data such as ⅜ in. trough or for flight weights which are not included in the tables.

The charts, Figs. 4 and 5, are provided so that one can separate the flight or trough cost from the standard conveyor cost and make the necessary adjustment if double flighting or stainless steel flight or trough is desired. Table V gives factors to use for these conversions.

After the bare conveyor cost has been estimated the cost of the drive and freight may be added. Table IV lists representative drive costs up to 20 hp. These are based on using totally inclosed gear head motors or motors mounted integrally with a gear reducer, sprockets and chain, and a chain guard. Adjustments which vary from this can be made, if required, by using a little engineering judgment; as for example, an adjustment for explosion proof motor would require only adding the difference in price of an explosion proof motor and a totally inclosed motor of the required horsepower. These variations, when required, can be found in any motor price book. Unless they are of some consequence the difference will be less than the accuracy of the estimate.

The manner of using these charts and tables may be more clearly understood from a few illustrated examples. We shall use in these illustrations a base unit cost of $460.

SAMPLE PROBLEM NO. 1

Estimate the cost of a 12-in. screw conveyor 87 ft. long, using XXX helicoid steel flights, ¼-in. steel trough, with one feed connection and three discharge spouts, one of which contains a rack-and-pinion gate. A 5 hp. drive is required.

Solution:

Cost of standard 12-in. conveyor 87 ft. long (Fig. 1): 3.6 × basic unit = 3.6 × $460 =	$1,656
Add for XXX flight (Table II): 25.8% of $1,656 =	427
Add for ¼-in. trough (Fig. 3): 24% of $1,656 =	397
Add for one additional discharge spout (Table III): 3.6% of $460.	17
Add for one additional discharge spout with rack-and-pinion gate (Table III): 12.5% of $460 =	58
Add for drive (Table IV): 1.25 × $460 =	575
Total estimated cost	$3,130

SAMPLE PROBLEM NO. 2

Estimate the cost of a 16-in. conveyor 58 ft. long using a standard steel trough and steel ribbon flight. One feed connection, one discharge spout and a 7½ hp. drive will be required. (Note that no addition is made for feed or discharge spouts as they are included in the $460 price of a standard unit.)

Solution:

Cost of standard 16-in. conveyor 58 ft. long (Fig. 1): 3.8 × $460 =	$1,748
Add for ribbon flight (Fig. 2): 27% of $1,748 =	470
Add for drive (Table IV): 1.5 × $460 =	690
Total estimated cost	$2,908

SAMPLE PROBLEM NO. 3

Estimate the cost of a 9-in. conveyor 40 ft. long using XXX steel flight and standard weight 304 stainless steel trough and cover with one feed connection and one discharge spout. A 3 hp. drive will be required.

Solution:

Cost of standard 9-in. conveyor 40 ft. long (Fig. 1): 1.25 × $460	$575
Add for XXX flight (Table II): 14.8% of $575 =	85
Steel conveyor with XXX flight: $575 + $85 =	660
Cost of steel trough (Fig. 4): 46% of $575 =	265
Cost of conveyor less trough: $660 − $265 =	$395
Add for 304 trough (Table V): 4 × $265 =	1,060
Add for drive (Table IV): 1.01 × $460 =	465
Total estimated cost	$1,920

SAMPLE PROBLEM NO. 4

Estimate the cost of a 9-in. conveyor 60 ft. long with 304 stainless steel standard weight trough and ⅜ in. stainless steel flight, with one feed connection and one discharge spout. Shafts, hangers, etc. are to be of standard materials. A 5 hp. drive will be required.

Solution:

Cost of standard 9-in. conveyor 60 ft. long (Fig. 1): 2 × $460 =	$920
Add for 3/16-in. flight (Table II): 5.6% of $920 =	52
Standard flight (Fig. 5): 17.4% of $920 =	160
Total for 3/16 steel flight: $52 + $160 =	212
Stainless steel flight (Table V): 4 × $212 =	$848
Standard trough (Fig. 4): 48.2% of $920 =	443
Stainless trough (Table V): 4 × $443 =	1,772
Components not affected by changes: $920 − ($160 + $443) =	317
Add for drive (Table IV): 1.25 × $460 =	575
Total estimated cost	$3,512

To estimate an all stainless steel conveyor 85% of the comparable steel conveyor can be multiplied by the proper conversion factor and recombined with the non-converted 15% to arrive at the estimated stainless conveyor cost.

The examples given above were chosen to illustrate the use of the various tables and curves. The estimator with this information and with the aid of reasonable judgment should be able to estimate the average cost of a given conveyor with better accuracy and in less time than heretofore. Freight can be estimated separately with judicious use of the weights of standard conveyors given in Table I. Conveyor costs and factors used in this article include the manufacturers' engineering costs but do not include freight, supports, or installation. In general screw conveyor costs may be considered as representing about 70 percent and installation about 30 percent of the installed cost.

Estimating the costs of screw conveyor supports must be handled separately and does not fall within the scope of this article.

I—Trough Thickness and Weight of Standard Conveyors (to figure freight cost).

Conveyor Size, In.	Trough Thickness, Gage	Wt. of Standard Conveyor 100 Ft. Long, Less Drive, Lb.
4	18	1150
6	16	1860
9	14	2650
10	14	2920
12	12	4340
14	12	5220
16	12	6590
18	10	7870
20	10	9340

II—Factors for Heavy Flights (in percent of standard conveyor cost).

Conveyor Size	Helicoid Sectional	Conveyor Flights X 3/16"	XX 3/16"	XXX ¼"	⅜"
4	.....	.....	.....	.....	.....
6	.....	.....	5.9	7.2	.....
9	.....	5.6	.....	14.8	22.0
10	.....	.....	.....	.....	.....
12	.....	2.7	.....	25.8	31.7
14	.....	.....	10.5	.....	16.6
16	.....	.....	.....	9.1	10.6
18	.....	.....	.....	5.5	10.7
20	.....	.....	.....	5.0	16.2

III—Factors for Extras (in percent of basic unit cost).

Conveyor Size	Feed or Discharge Spouts	R & P Gate & Spout
4	2.0	9.1
6	2.3	9.9
9	3.6	12.5
10	4.3	14.5
12	4.8	17.4
14	6.2	20.6
16	7.5	24.8
18	10.6	29.7
20	13.2	34.6

IV—Factor for Drive (ratio of drive to basic unit cost)

Drive Hp	Cost Ratio
1	0.69
1½	0.82
2	0.89
3	1.01
5	1.25
7½	1.50
10	1.87
15	2.12
20	3.03

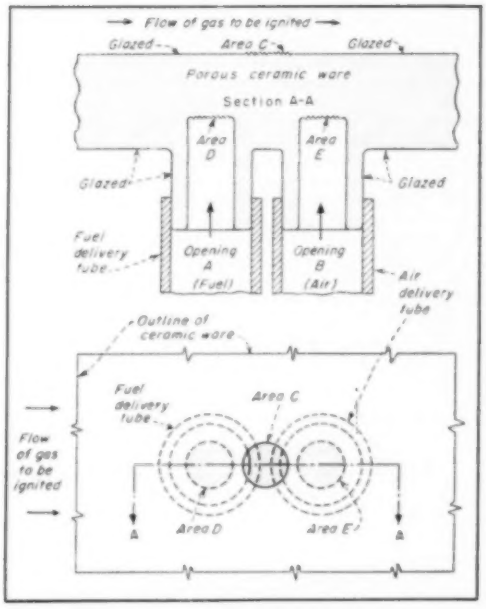
V—Factors for Different Materials

Type 304 group stainless steel	4 times steel*
Type 316 group stainless steel	6 times steel*
Double flighting	1.75 times single flighting

* Stainless steel prices do not include polishing which may sometimes be required in food plants. Polishing costs can be appreciable, but vary considerably, according to degree of polish required.

The Plant Notebook

THEODORE R. OLIVE, Senior Associate Editor



Non-Extinguishable Pilot Light For Combustion Processes

WALTER G. THOMPSON, *Minneapolis, Minn.*

September Contest Prize Winner

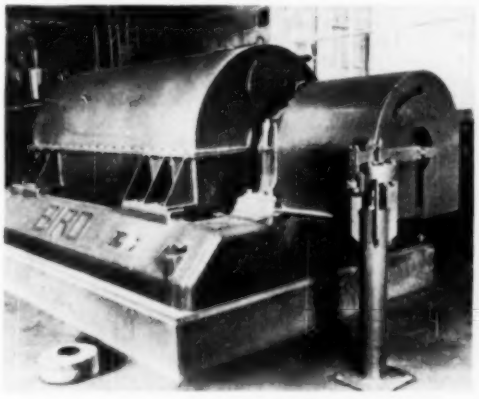
In a number of combustion processes, especially those that take place at extremely high velocities, combustion is difficult to initiate because of the difficulty of keeping a pilot light going in a high velocity jet of air. Also there may be trouble because of the stream flow obstruction produced by the lighting device. Examples are found in jet propulsion and in some kinds of blast furnaces. Other examples include burning the fumes from sulphate pulping process digester blow-pits, and the improvement of conventional submerged combustion processes by substituting a new porous burner for the usual deep burner casing.

It is the purpose of the present article to suggest a type of pilot light which gets away from both of the difficulties mentioned. This it does by having no flame in the ordinary sense, instead having the pilot light burning within the pores of a porous material such as a ceramic.

The two sketches tell the story. The upper sketch represents a cross-section of the lower. Fuel enters through opening *A* and air through opening *B*. The body of the burner is a porous glazed ceramic from which the glaze has been removed at areas *C*, *D* and *E*. The porosity is such that the fuel and air can pass through at a rapid rate, while the removal of glaze permits ingress and egress of the gases. Within the structure mixture takes place and at first the mixture issues at *C* where it is ignited. Then, as the surface temperature rises past the ignition point of the mixture, combustion begins to take place in the surface at *C*. As the body temperature rises, the combustion begins to recede into the ceramic until, under proper conditions, it will be completed entirely within the body of ceramic, and only the hot combustion gases will reach the surface at *C*. This requires only a short time. When the desired conditions are achieved, the surface temperature of the ceramic will be high enough to ignite combustible materials which contact it.

Proper proportioning of gas and air for the pilot can be attained by using positive pumps of any suitable type, properly synchronized. The indicated arrangement, with the pilot light built into the combustion apparatus so that the flow to be ignited is parallel to the pilot surface, is only one of many possible arrangements. It has been shown in this way to fulfill the initial conditions of a pilot light that will neither be blown out, nor obstruct the flow in the combustion chamber.

Instead of a ceramic, it is possible to use a porous metallic body which can be prepared in a number of ways. For example, it might be made of sintered, powdered metal, pressed into a desirable shape, or from an alloy which can be made porous by thermal evaporation of one component under high vacuum. A block shaped from a metal carbonyl and then decomposed by heating should also be satisfactory. If it is possible to use a material which will catalyze the oxidation reaction, the result should be still more satisfactory.



Continuous Centrifugal Feed Control

Engineers in a large chemical plant recently worked out a method for controlling the feed to a Bird solid-bowl continuous centrifugal which they say is more satisfactory that methods earlier employed. Earlier methods suffered from vibration present in the high-speed operation of the 1,200-rpm. separating machine. To the drive for the internal screw conveyor of the Bird they attached a Hagan ThrusTorq, which is an air-operated force-measuring de-

vice. This measures the torque of the planetary gear drive, records its magnitude, and automatically controls the rate of slurry feed to maintain a constant load on the conveyor screw.

Diesel Locomotives Save Calco $40,000 per Year

At the Bound Brook, N. J., plant of the Calco Chemical Div. of American Cyanamid Co. two GE diesel-electric switching locomotives, a 44-tonner and a 65-tonner, are saving more than $100 per day compared with the two steam locomotives they replaced in transfer work and intra-plant switching. One has been in use for 2½ years, the other a year longer. Both work 16 hr. per day and have over 95 percent availability. Biggest savings are in fuel—about $5 per hour—and maintenance, about $1 per hour compared to former equipment. Some saving comes from the ease with which they negotiate sharp curves in the plant. There have been no derailments with the diesel-electrics, although the steam equipment averaged over one derailment a week.

Lab Aspirator Makes Efficient Steam-Water Mixer

D. W. Carnell, *Ammonia Dept., E. I. du Pont de Nemours & Co., Wilmington, Del.*

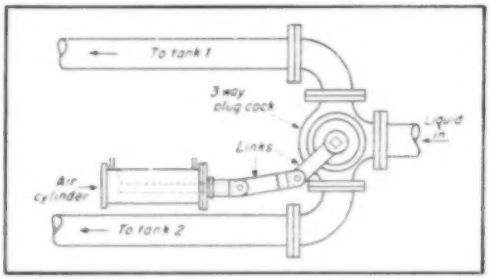
In semiworks units it is very often necessary to have a source of hot water, the temperature of which can easily be varied. An obvious solution is to mix steam and water in varying proportions. Commonly, this is done by connecting the lines to a tee and mixing there. There is a large amount of noise and vibration when water is heated this way. Near the boiling point, alternate slugs of steam and hot water form and the vibration may break off iron pipe in a week or so.

Commercial steam-water mixers of the jet type are available, but they are of rather large capacity and too expensive for use on experimental units.

Our particular problem required about 20 independent hot water streams for line tracing, heaters, etc. A mixer which gave quiet operation and any temperature between cold water temperature and 100 deg. C. was made as described below.

A laboratory type water jet aspirator was modified by welding pipe nipples to the hose connection side arm and the unthreaded discharge. A water line was connected to the normal water inlet through a control valve, and a steam line was connected to the side arm through a valve. The tail pipe was connected to the system requiring the hot water. A well thermometer was installed in a tee at the mixer discharge to indicate water temperature.

At 80 psig. water pressure and 120 psig. steam pressure a maximum rate of 1.3 gpm. at 95 deg. C. was obtained. Capacity was increased to about twice that if water at 60-70 deg. C. was desired. Once the control valves were set manually to give the desired water temperature, normal variations in steam and water supply pressures did not cause more than about ±2 deg. C. variation in temperature.



Three-Way Plug Cock Actuated By Air Cylinder

Joseph I. Lacey, *Hooker Electrochemical Co., Niagara Falls, N. Y.*

A 4-in. three-way plug cock was located under an operating platform, in a recent installation, so that it was very difficult to operate with an extension handle, even though it was throughly lubricated. The location of the

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OCTOBER PRIZE WINNER—A $50 prize will be issued to . . .

W. P. STEVENSON

Polychemicals Dept., E. I. du Pont de Nemours & Co., Arlington, N. J.

. . . for an article describing a novel tilted table dewaterer for the separation of liquids from solids in cases where the solid tends to hold the liquid in irregularities of the particle surfaces. This article, winner of our October contest will appear in the December issue.

$50 PRIZE FOR A GOOD IDEA—Until further notice the Editors of *Chemical Engineering*, will award $50 cash each month to the author of the best short article received that month and accepted for publication in the Plant Notebook.

The winner each month will be announced in the issue of the next month, e.g., the November winner will be announced in December and his article published in January. Judges will be the Editors of *Chemical Engineering*. Non-winning articles submitted for this contest will be published if acceptable at usual space rates.

HOW TO ENTER CONTEST—Any reader of *Chemical Engineering*, other than a McGraw-Hill employee, may submit as many entries for this contest as he wishes. Acceptable material must be previously unpublished and should be short, preferably not over 300 words, but illustrated if possible. Articles may deal with any sort of plant or production "kink" or short-cut that will be of interest to chemical engineers or others in the process industries.

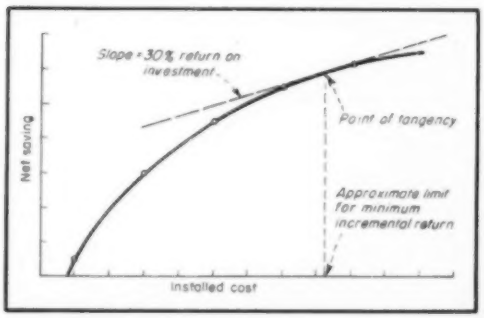
Also, novel means of presenting useful data, as well as new cost-cutting ideas, are acceptable. Address Plant Notebook Editor, *Chemical Engineering*, 330 West 42nd St., New York 18, N. Y.

valve was fixed by piping and flow conditions. Its purpose was to send an intermittent flow of liquid into one of two tanks, but it was not used as a shut-off valve. Thus only two valve stem positions were needed.

The difficulty was overcome by the use of an air cylinder. A 5-in. diameter by 12½-in. stroke cushioned air cylinder was mounted on the 4-in. line, with its weight properly supported. Connecting links transformed the linear motion of the cylinder to the rotary motion of the plug cock. The links were designed so that the travel of the piston gave 90 deg. rotation to the plug. The choice of cylinder was arbitrary, as it had been left over from a previous project. It had more than enough force to move the plug cock.

The air supply to the cylinder was controlled by a special four-way plug cock. This cock was designed to control the air to the cylinder and was supplied by the cylinder manufacturer. It was mounted on the operating platform at a convenient location. The piping followed the manufacturer's recommendations. Globe valves in the lines to each side of the cylinder were throttled to retard the speed of the piston.

This has been a very satisfactory installation and there has been only routine maintenance. A rough cost analysis showed that this installation was cheaper than a motor operated valve with similar flow characteristics. Although this setup was for a 4-in. three-way plug cock, the principle will hold for other sizes and types of plug cocks.

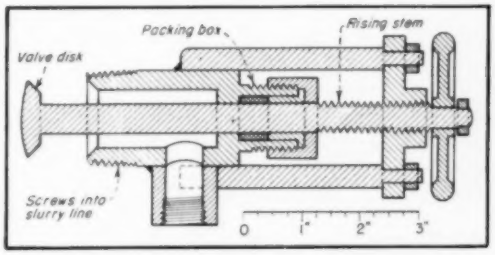


Graphical Analysis Assures Correct Investment for Saving

HAROLD F. REICHARD, *Chemical Engineer, Milltown, Conn.*

In most organizations an installation for savings must yield a minimum standard return on the investment in order to be approved. To play the game honestly, the engineer doing the calculating on most jobs must also be sure that each increment of investment, above that required to earn a part of the saving, yields an incremental return meeting the organization's minimum standard. Such watchfulness is particularly necessary for such calculations as recovery of waste heat from a fluid stream, as a typical example. In such a case the possible investment would increase in about direct proportion to the heat-transfer area, while the savings would rise steeply for a while, starting with zero heat-transfer area, but gradually would level off at a maximum possible saving.

Making certain that the correct investment is chosen in this type of calculation is very easily done by use of a curve of the type shown. Net savings obtainable are calculated for several sizes of heat exchanger, the installed costs estimated, and a curve drawn through the points obtained. A straight line (drafting triangle) with a slope equal to the chosen standard return on the investment is applied to the curve as shown. It is easy to read off the investment beyond which less than the minimum incremental return is earned.



Sampling Valve Avoids Trouble From Solids Plugging

V. SCHULTZ, *Maintenance Superintendent, The Permanente Metals Corp., Baton Rouge, La.*

In the past, much difficulty was encountered in our plant in sampling slurry lines. The main difficulty was that we were unable to keep the sampling valves and lines from plugging.

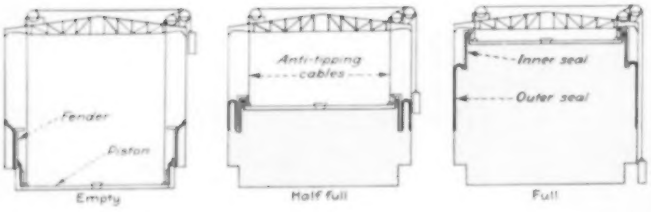
I designed a bayonet type sampling valve which has been in use for several months and has proved to be very satisfactory. Its features will be entirely clear from the accompanying drawing.

Device Limits Hoist Load

Tooling superintendent Wally Marrow, of Solar Aircraft's San Diego plant, worked out a simple gadget to limit automatically the load lifted by a 2-ton Shepard-Niles hoist. Calibration is such that a load within 5 percent of the hoist capacity will cut off power, set the brake, and leave open only the lowering circuit. The mechanism uses a heavy-duty die spring which compresses when the load is picked up. When a critical compression is reached a switch is actuated to carry out the above mentioned series of operations.

Process Equipment News

THEODORE R. OLIVE, Senior Associate Editor



Artists' drawing of projected 500,000 cu. ft. Wiggins gasholder. Drawings show operation of piston and seals during filling.

Waterless Gasholder Uses Piston Without Sliding Parts

Modified Wiggins gasholder in sizes to 500,000 cu. ft. is now suitable for storing various chemical gases such as hydrogen

Developed by John Wiggins some 14 years ago, as the first dry-seal gasholder, the progenitor of the model now introduced by General American, was initially used for conserving gasoline vapors in refineries as part of a vapor balancing system. Until recently, practically all installations were of that type. Operating pressure was negligible. Recently it was decided to adapt the principle to the storage of chemical process gases at pressures up to 20 in. of water. Mechanical design was modified for the higher pressure and seal fabrics were investigated from the standpoint of their permeability and resistance to the solvent and chemical action of the various gases that might be encountered. These problems solved, the holder is now offered as a storage device for such gases as hydrogen, nitrogen, blue gas, methane, carbon monoxide and dioxide, other fuel gases, petrochemical gases, oxygen, and sewage digester gas.

At present under construction are units of 100,000 cu. ft. capacity, for sewage digester gas, and of 500,000 cu. ft. capacity for a mixed gas similar to blue gas. Advantages claimed for the design are that it has no operating cost, requires very little maintenance or inspection, and is unaffected by weather conditions. The holder has a frictionless and absolutely dry seal which is unaffected by the gas and can be operated at any predetermined pressure up to 20 in. water. Since the dead space with the piston down is only a half of 1 percent, the unit is easily purged.

Construction and operation of the holder will be evident from the sketches above which portray the three stages of empty, half full and completely filled. The shell consists of a structure of plates, only the lower portion of which needs to be gas tight. Centered within this is a circular deck which, together with the fabric seals, serves as the gas-tight piston. Weights applied to the top of the deck determine the operating pressure. The piston floats on the confined gas, rising and falling with changes in the volume of stored gas. Any possibility of tipping of the piston is overcome by a leveling system consisting of two or more pairs of diametrically placed cables attached to a single leveling weight.

The most interesting feature of the design is the dry seal which is composed of two circular curtains of coated fabric consisting of a glass-asbestos core impregnated and coated on both sides with neoprene. One curtain is attached at its upper edge to the wall of the holder about one-third of the way up. The other is attached at its lower edge to the periphery of the piston. Both curtains are secured at their other edges to a telescoping fender made in the form of a ring which moves in the annular space between the piston and the wall. In the empty position the fender rests on the shell offset which is used to minimize dead space when empty, while the piston rests on the holder bottom.

As gas enters, the seals first inflate, then the piston begins to rise, carrying the inner seal with it. When the holder is one-third full the piston starts to lift the fender and with it the outer seal which, with a sort of rolling motion, transfers from the fender to the wall, without sliding or rubbing on its supporting surfaces. Finally, when the holder is full, as determined by stops at the top of the structure, both seals are extended in an upward direction. To prevent overfilling, a mechanically operated relief valve is provided, while vacuum protection can also be afforded by placing the outlet line so that it will be covered in the empty position by the outer seal, which is then supported by a grid.

General American Transportation Corp., Plate and Welding Div., 135 South La Salle St., Chicago 90, Ill.

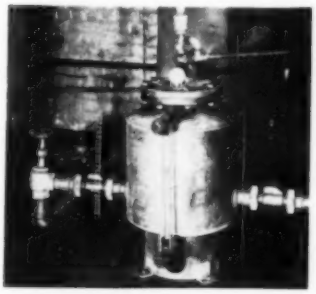
MAN-COOLER:

Portable Ventilator

Mine Safety has announced a new line of portable ventilators, powered either by gasoline motor or electricity and equipped with high velocity fans for both ventilating and cooling. Air is conveyed to the desired point through a collapsible 14-in. dia., 16-ft. long canvas duct. This duct can be connected to either the inlet or discharge side of the fan. Such ventilators can be used for cooling equip-

ment in hot spaces preparatory to repair work, as well as for ventilating equipment in which work is in progress. For heavier duty requirements, two or more ventilators can be connected in series.

Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh 8, Pa.

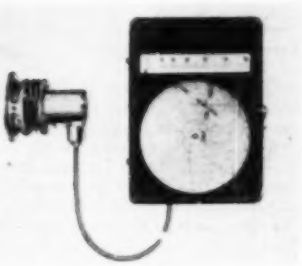


FLUID PRESSURE OPERATED:

Cycling Jet Pump

Except for a float-controlled operating valve and two check valves, there are no moving parts in the new Penberthy cycling jet pump. This pump consists of a receiver tank, float controlled operating valve, ejector, necessary piping, gages and valves. It may be operated by gas, steam or air pressure and will discharge against heads approximately equal to the motive fluid pressure used. Operation is as follows: With the receiver empty, the float is in its lowest position and the motive fluid is directed into the ejector, creating a vacuum in the receiver. Liquid to be pumped is thus drawn into the receiver. As it fills, the float rises, finally closing the control valve and diverting the motive fluid pressure from the ejector to the receiver. This closes the inlet valve, opens the outlet valve, and discharges liquid from the receiver. The cycle then repeats. Pumps are now available in the 2-in. size, particularly for such applications as the handling of corrosive chemicals, viscous liquids, and for operation in hazardous areas where motors are not desired.

Penberthy Injector Co., 1242 Holden Ave., Detroit 2, Mich.

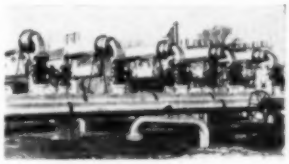


QUICK ACTING:

Radiation Pyrometer

A new Bristol pyrometer for indicating, recording or controlling temperatures up to 4,000 deg. F. in furnaces and kilns is known as the Pyrovisor and operates on the radiation principle. The temperature-sensitive head is mounted outside the hot zone, picking up radiant energy emitted from the surface of the object under measurement. Extremely rapid response is claimed, producing a 99 percent response to a temperature change within 1 sec.

The Bristol Co., Waterbury 20, Conn.



REMOVES LIQUIDS, DUST:

Dry Gas Scrubber

A new model Aerotec scrubber employing centrifugal precipitation is now being offered for scrubbing gas to remove both liquids and dust. Average efficiencies as high as 99.6 percent are claimed on typical pipeline dust. Furthermore, extremely high capacity is possible. At some of the Big Inch pipeline compressor station, standard 100,000,000 SCFD units were manifolded to give a total capacity of 500,000,000 SCFD. These units are available in a variety of sizes up to 100,000,000 SCFD. Vertical units are employed where both liquids and solids are to be removed from the gas, while horizontal units, as illustrated, are used primarily for removing liquids such as water and distillates.

Features claimed for the new scrubber include ability to remove both entrained liquids and dusts indiscriminately; much smaller and lighter construction than any other type of scrubber; ease of installation; and piping simplicity. Scrubbers of this type are claimed, because of the operating principle used, to be unaffected by overload.

The Thermix Corp., First National Bank Bldg., Greenwich, Conn.

(Continued)

This Month . . .

As Chemical Show season rolls around, chemical engineers have a more than usual interest in ingenious equipment ideas. You will find many on later pages. For example . . . Do you need an accurate method of measuring continuously the concentration of sulphur compounds such as mercaptans, disulphides, SO_2 and H_2S, in gases? Then, see p. 136 for a brand new **sulphur compound detector.** . . Or if you have the common problem of finding better corrosion resisting valves, the **Teflon sealed cocks** on p. 138 may be your answer. . . Many processes are going to precoat filtration today, which adds interest to a newly developed **automatic precoat filter,** described on p. 142. . . Or again, if you're looking for the solution to the problem of storing volatile liquids without vapor loss, you will be interested in the new design **spheroidal tank** described on p. 146.

Next Month . . .

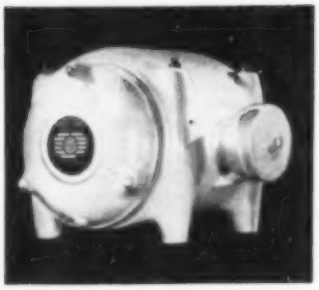
We'll be combing the Chemical Show for new ideas which these pages later will feature. Meanwhile, next month, be on the look-out for . . . a new **liquid-liquid extractor** permitting many theoretical stages in a single column . . . an **index-of-refraction recorder** which gives process industries a new control variable . . . and many others.

Marshall and Stevens Indexes of Comparation Equipment Costs

(1926 = 100)

Compiled quarterly for March, June, September and December of each year by Marshall and Stevens, evaluation engineers, Chicago and Los Angeles. Indexes are prepared for 47 different industries, from which the eight process and four related industries listed here are selected. Published each month with the latest available revision. For a description of the method of obtaining the index numbers see R. W. Stevens, **Chemical Engineering,** Nov. 1947, pp. 124-6. For a listing of annual averages since 1913 see **Chemical Engineering,** Feb. 1949, p. 129.

Industry	Sept. 1948	June 1949	Sept. 1949
Average of all.....	166.5	160.6	159.6
Process Industries			
Cement mfg.	160.5	155.9	155.9
Chemical	168.5	163.9	163.4
Clay products	155.5	150.9	150.4
Glass mfg.	158.6	154.0	153.5
Paint mfg.	161.8	157.2	156.7
Paper mfg.	162.1	157.5	157.0
Petroleum ind.	164.9	160.3	159.8
Rubber ind.	167.3	162.7	162.2
Process ind. avg....	165.9	161.4	160.4
Related Industries			
Elec. power equip....	170.1	165.5	165.0
Mining, milling	169.2	164.6	164.1
Refrigerating	181.5	174.8	173.9
Steam power	157.2	152.6	152.1

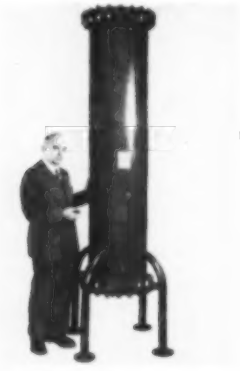


SPLASH-PROOF:

Inclosed Motor

Not only for use in food plants, but also for pharmaceutical and chemical plant applications is a new U. S. sanitary motor, just put on the market. The motor is totally inclosed and can be hosed down, or scrubbed if desired, without danger. It employs machined flush joints, universal mountings, an adjustable sealed terminal box, asbestos-protected windings, and a centrifugally cast rotor. Sizes range from ½ to 7½ hp. The exterior is a corrosion and abrasion-resistant baked white enamel. Bearings are permanently lubricated and sealed to prevent leakage. The shaft opening is protected by a rotary slinger against entrance of water or contaminants.

U. S. Electrical Motors, Inc., 200 East Slauson Ave., Los Angeles 54, Calif.



OPERATE CATALYTICALLY:

Gas Purifiers

Through the use of newly developed Engelhardt catalysts, Baker & Co. has expanded applications of its Deoxo process. The new catalysts are said to last indefinitely, although, if poisoned, they have a resale value. The new Model M purifier catalytically combines oxygen and carbon monoxide to form carbon dioxide in gases which do not contain hydrogen. However, at temperatures between 120 and 160 deg. C., carbon monoxide can be oxidized in a hydrogen-rich atmosphere. This model can also be used for oxidizing hydrogen in oxygen. Model DM catalytically oxidizes both carbon monoxide and hydrogen at temperatures between 120 and 500 deg. C. Model E produces methane and water vapor from carbon monoxide and hydrogen. These units are being produced in sizes from 200 to 100,000 cfh. They supplement the previously introduced Model P intended for oxidizing hydrogen with oxygen in the presence of carbon monoxide.

Baker & Co., East Newark, N. J.

GUARDS PRODUCTION:

Turbidity Detector

Known as Purifil, a new electronic device provides instant detection of solids suspended in transparent liquids, even though the quantity of impurities is extremely small. The unit actuates a warning device when impurities exceed a limit, or it can initiate other operations such as shutting down the flow. The device utilizes the ratio of scattered light to transmitted light falling on a single photo tube. Its action is therefore independent of the color of the solution and is unaffected by aging or drift in the photo tube or lamp, or by line voltage changes. Typical applications include delivery from clarifying operations, such as filtration or centrifugation. Adjustment for permissible cloudiness is easily made by turning an index knob. At maximum sensitivity, for example, the device will function at 5 ppm. of bleaching earth suspended in oil, or 0.5 ppm. of nickel catalyst suspended in hydrogenated fat.

Electric Eye Equipment Co., Danville, Ill.

MONITORS GASES:

Sulphur Compound Detector

After about a year of field testing, commercial models of the new Consolidated Titrilog continuous sulphur compound detector are now available. This instrument, known as Model 26-102, employs a novel automatic titrating system for compounds such as SO_2, mercaptans, H_2S, thio ethers and disulphides. It has a limit of detecting of roughly 0.1 ppm. of sulphur. Certain compounds such as aldehydes, ketones, CO and acetylene

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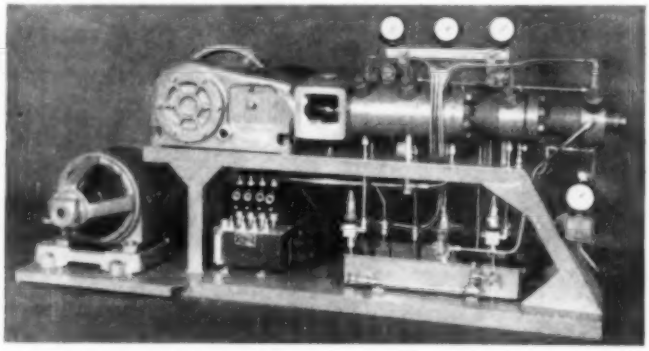
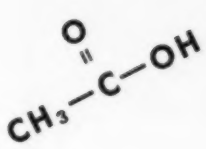


HIGH-PRESSURE COMPRESSOR

Semi-portability, pressures to 6,000 psi., and displacements of 1 to 3 cfm., are found in this new Norwalk high-pressure compressor. It has four stages, can be supplied on wheels or on a solid base, and can be provided with materials of construction suitable for any gas that can be pumped. *The Norwalk Co., South Norwalk, Conn.*

CELANESE* ACETIC ACID U.S.P.



- *IMMEDIATE SHIPMENTS*
- *REGULAR AND CONTINUOUS SUPPLY*
- *AVAILABLE FOR 1950 CONTRACTS*

Celanese Acetic Acid U.S.P. is available in tank car quantities or less from the Celanese Chemcel plant near Bishop, Texas. Large storage facilities at Rock Hill, South Carolina, offer the speed of overnight tank truck deliveries to customers along the Southeastern Seaboard.

SPECIFICATIONS

Water Content	0.5% by weight, maximum
Freezing Point	15.6° C., minimum
Specific Gravity	1.050 to 1.055 @ 20/20° C.
Color	Water white
Formic Acid Content	0.05% by weight, maximum
Non-Volatile Matter	0.001% by weight, maximum
Iron Content	1.0 PPM by weight, maximum
Permanganate Time	2 hours, minimum

Get in touch with your Celanese representative in Boston, Detroit, Chicago, San Francisco or write Celanese Corporation of America, Chemical Division, Dept. 53-K, 180 Madison Avenue, New York 16, N. Y.

ACETALDEHYDE

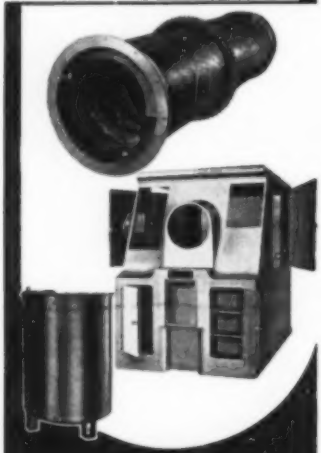
2 carbon aldehyde is produced through direct oxidation of petroleum natural gases. Acetaldehyde is available in large or small quantities from Bishop, Texas. Here's a source for this aldehyde that you can depend on.

Celanese* CHEMICALS

*Reg. U.S. Pat. Off.

ACIDS · ALCOHOLS · ALDEHYDES · GLYCOLS · KETONES · SOLVENTS · PLASTICIZERS · INTERMEDIATES

LITTLEFORD
FABRICATORS
of ALLOY
METAL PRODUCTS



Working with Stainless Steels, Nickel, Monel, Everdur and all corrosion resistant metals and alloys since their inception has given Littleford unexcelled experience. No fabricated alloy metal product, either common place or out-of-the-ordinary, is a problem with the Littleford facilities and equipment.

Perfection in fabrication is a known fact to the Process Industries when Littleford does the work. Send blueprints, see how experience can insure economies in fabrication.

FABRICATORS OF PLATE AND SHEET METALS

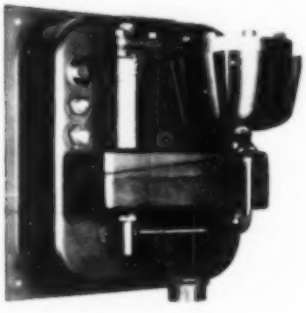
LITTLEFORD

LITTLEFORD BROS., INC.
428 E. Pearl St., Cincinnati 2, Ohio

do not interfere and so need not be removed from the sample stream. Olefins and diolefins react, however, enough to cause interference with sulphur measurements.

The instrument continuously titrates electrolytically generated bromine with the reactive compounds. The rate of bromine generation is automatically controlled so as to equal its rate of reaction with the reactive gas. The current expended in generating bromine is then recorded in terms of the sulphur compound concentration of the sample gas. To accomplish this, bromine is generated in a titration cell suspended in a tank of electrolyte. Through electrodes within the cell and in the outer tank a voltage is produced which depends on the bromine concentration. This voltage is balanced against a reference voltage in such a way as to control the flow of current to the bromine generating electrodes. When reactive gas is flowing, this system operates to replace the bromine lost by reaction. When no gas is flowing only a small zero current flows, sufficient to replace the bromine lost mechanically.

Consolidated Engineering Corp., 620 North Lake Ave., Pasadena 4, Calif.



MAGNETIC TRANSMISSION:

Improved Flow Meter

A magnetic clutch, which eliminates much of the friction encountered in transmitting float movements to the pen arm in usual flow meter constructions, has been adapted by Hays in a new flow meter known as the Hays-Penn Magna-Clutch. The meter employs an exceptionally large float and long float travel, but through the magnetic arrangement requires no stuffing box or pressure-tight bearing. Instead, float movement is transmitted through a pressure-tight manometer wall by means of the magnetic clutch. Adjustable range tubes enable these meters to be used anywhere throughout the range from 17 to 750 in. water differential, with working pressures up to 2,500 psi. Recording, indicating and integrating meters are available.

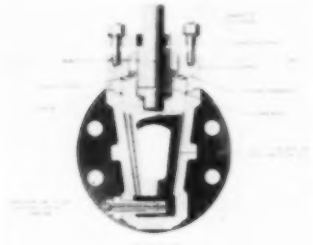
The Hays Corp., Michigan City, Ind.

FOR HAZARDOUS AREAS:

Explosion-Proof Switch

Designated as Fig. ST-5500, a new explosion-proof switch box, accommodating mercury tubes to make and break electrical circuits, is now on the market, approved by Underwriters Laboratories for Class 1, Group D, hazardous locations at ambient temperatures up to 155 deg. F. The body and cover are of cast aluminum, provided with a threaded hub through which a stainless steel operating shaft passes, carrying the mercury tubes. These are actuated by tipping motion of the shaft. The switch is suitable for turning on lights, sounding horns, or alarms, or other small power applications in areas contaminated with flammable or explosive vapors.

Shand & Jurs Co., Berkeley, Calif.



RESISTS CORROSION:

Lubricated Plug Cocks

Two new series of lubricated plug cocks, designated respectively as Type B and Type A, are being offered currently by Duriron. Type A, available in sizes from 1 through 3 in., is a redesign of the top-lubricated plug valve made by this company for many years. To utilize hard corrosion-resisting alloys, such as Duriron or Durichlor, it

(Continued)

GATX

SERVICE FOR SHIPPERS

Specialized tank cars for more efficient shipping of liquids are designed and built at General American's plants.

General American's maintenance shops, located throughout the country, keep GATX cars rolling.

In cooperation with the railroads, experienced record keeping and traffic control distribute GATX cars to meet shippers' special and seasonal requirements.

The GATX reporting mark identifies the General American fleet of more than 40,000 tank cars of 207 specialized types. This fleet, built in General American's own plants and serviced by General American's shops and offices everywhere, continues to give shippers the safe, economical transportation of bulk liquids they need.

GATX GENERAL AMERICAN

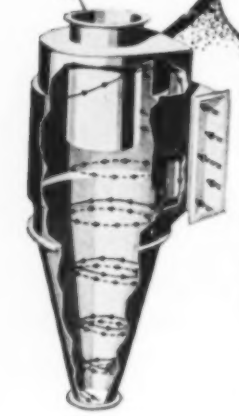
GENERAL AMERICAN
Transportation Corporation

135 South LaSalle Street • Chicago

District Offices: Buffalo • Cleveland • Dallas
Houston • Los Angeles • New Orleans • New York
Pittsburgh • St. Louis • San Francisco • Seattle
Tulsa • Washington
Export Dept., 10 East 49th Street, New York 17, New York

Minutely precise planning
is vital in RECOVERING
VALUABLE

DUST



Butterfly net promises

to catch everything are unrealistic in trapping fines, ultra-fine and finer-than-that in dust particles. But Buell adjusts its equipment and your costs to do a maximum job where results are tangible. No guesswork, no overall assumptions; but a special laboratory analysis of your dust into fractions of different micron-size grading—and a guaranteed performance on each fraction . . . Scientifically arrived-at assurance of potential results is a fundamental part of Buell's engineering service. It is freely available, with no obligation whatsoever. Bring us your problems . . . or, as a preliminary, let us send you 'Engineered Efficiency in Dust Collection'. Write: Buell Engineering Company, 70 Pine Street, Suite 5040, New York 5, N. Y.

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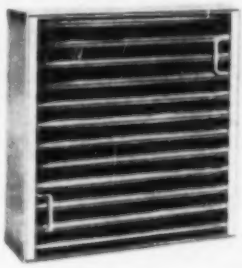
Engineered Efficiency in
DUST RECOVERY

Manufacturing in the United States and Canada for shipment throughout North and South America.

NEW EQUIPMENT, cont. . .

uses a composite plug with an unbreakable alloy shank permanently bonded to the plug. Durimet 20 is used for the body and gland, while the packing consists of alternate layers of hard and resilient material with a new Teflon antifriction seal. Type B valves feature two new basic designs, one of which is illustrated here. One type is top-lubricated, and the other a bottom-lubricated valve. Bottom lubrication is used where a hard alloy plug requires composite construction. A wide range of corrosion-resisting alloys can be used for the bodies of both types, while in the bottom-lubricated type, hard corrosion resisting alloys such as Duriron or Durichlor are used. The illustration shows clearly how the new Teflon diaphragm is used to provide a corrosion-resisting, self-lubricating seal. It is claimed that the plug can be turned with ease, even when under considerable gland pressure. Type B valves are made in sizes from ½ to 6 in., for 175-lb. service.

The Duriron Co., Dayton 1, Ohio.



EASILY INSTALLED:

Carbon Air Filter

Fully 28 sq.ft. of filtering surface, giving a capacity of 1,000 cfm. of air, is secured in a filter unit occupying less than 3 cu.ft. of space in the new Dorex Type C air recovery cell now offered by W. B. Connor Engineering Corp. The overall dimensions of the cell are 24 × 24 × 8¾ in. Activated carbon is used to remove odors from the air, permitting its recirculation, and is contained in an "accordion pleat" construction which gives the large filtering area. A single filter is able to collect over 5 lb. of condensed impurities. This results, it is claimed, in an average service life of up to three years before reactivation of the carbon is necessary. By permitting more recirculation of stale air by deodorizing it, the manufacturer claims that each recovery cell is able to replace something like 2.5 tons of refrigeration capacity.

(Continued)

Because it combines easily with other materials . . . it absorbs and retains moisture . . . it does not evaporate easily . . . it is an excellent solvent, particularly for flavoring oils . . . and an effective anti-freeze—USP glycerine enjoys wide application in the food industry.

Where is it used? In ice cream . . . in chewing gum . . . in peanut butter . . . cake . . . meat seasoning compounds and many other food products—doing a wide variety of jobs: preserving, retaining freshness, improving texture and acting as a useful ingredient to prevent hardening in gelatin-base products. USP glycerine is easily digestible and energy-producing, not unlike conventional sugars and fats. It offers a unique combination of physical and chemical properties that cannot be matched by any other product!

That's why—for our daily food staples and in a great number of newly developed food products—*Nothing takes the place of glycerine!*

GLYCERINE PRODUCERS' ASSOCIATION
295 Madison Avenue, New York 17, N. Y.

Technical GLYCERINE NEWS

A UNIQUE COFFEE CONCENTRATE is said to preserve its aroma until used, according to a recent patent. A specially prepared powdered concentrate is added to freshly ground coffee which has been impregnated with glycerine. It is claimed that the resultant concentrate can be used in small cotton bags to make coffee of full flavor. (F-17)

★ ★ ★

REVISED GLYCEROL VISCOSITIES TABLE AVAILABLE. A new table of the viscosities of glycerine in aqueous solution from 0 to 100 per cent, at from 0 to 100 degrees C. has been prepared by the Research Laboratories of Glycerine Producers' Association. Write for your copy. (F-18)

★ ★ ★

CANDY MANUFACTURERS USING CERTIFIED FOOD COLORS will find that glycerine is not only an excellent solvent and suspending agent for FD&C colors but also an effective preservative as well. Where a color solution is to be kept for any length of time, it is advisable to add 25% of glycerine by volume or 32 ounces per gallon of water. (F-19)

★ ★ ★

GLYCERINE SECTIONS OF BEILSTEIN TRANSLATED! Now available for the first time, an English translation of the Glycerine Sections of Beilstein's famous *Handbuch der Organischen Chemie* (4th Edition). Complete in *one* volume entitled "GLYCERINE AND SOME GLYCERINE DERIVATIVES."

Publication authorized by the Attorney General of the United States. Compiled and edited by Dr. R. N. DuPuis, Dr. C. S. Miner, Jr. and J. B. Segur—long acknowledged as authorities in the field of Glycerine and its properties. Amassed in its 210 pages are an unusually large number of Glycerine derivatives with extensive cross-references. Also included are a complete table of contents and a detailed index of the derivatives and fatty acid esters of Glycerine. A timely, comprehensive volume for your chemical reference library.

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GLYCERINE PRODUCERS' ASSOCIATION, DEPT. 4
295 MADISON AVENUE
NEW YORK 17, N. Y.

I should like to know the source of those items appearing in Technical Glycerine News which I have checked below.

☐ F-17 ☐ F-18 ☐ F-19

NAME .....

COMPANY .....

ADDRESS .....

ROTARY
R-C Blower and Gas Booster mounted on same bedplate, with V-belt drives from 5 HP motor. Capacity, 125 CFM.
ONLY R-C dual-ability GIVES YOU dual choice
CENTRIFUGAL
R-C Centrifugal Blower —24" type OIB, driven by 250 HP motor. Capacity, 13,220 CFM.
H-175A

When it comes to choosing between Centrifugal and Rotary Positive Blowers and Exhausters, you'll get impartial suggestions from R-C *dual-ability*. That's because we build both —and we are the only blower manufacturer who gives you the benefit of this *dual choice*.

Another advantage of consulting us results from our wide range of units of both types. If it's 10 CFM you need, we'll supply it. Or, if your use calls for extremely large volume, we build them to any desired size.

One more point—air or gas handling equipment is our "bread and butter" . . . we have no other business. That means detailed and *interested* attention to your requirements from an organization that has specialized on that job for almost a century

ROOTS-CONNERSVILLE BLOWER CORPORATION
911 Illinois Avenue, Connersville, Indiana

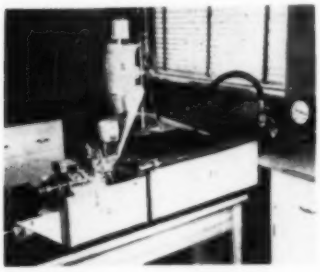
ROOTS-CONNERSVILLE BLOWER BUILDERS R C SINCE 1854

BLOWERS • EXHAUSTERS • BOOSTERS • LIQUID AND VACUUM PUMPS • METERS • INERT GAS GENERATORS

• • ONE OF THE DRESSER INDUSTRIES • •

or 80,000 Btu. of boiler and radiation capacity. The new units are easy to install in either flat or V arrangement. For abnormal odor concentrations, two cells may be installed in series.

W. B. Connor Engineering Corp., 114 East 32 St., New York 16, N. Y.



SELF-CLEANING:

Automatic Precoat Filter

A new idea in precoat filters, worked out primarily for continuous filtration of electroplating solutions, but suitable also for a variety of chemical industry uses, has been developed by Commonwealth Engineering Co. The filter drum is similar to that of other rotary vacuum precoat filters, except that the outside layer of precoat is automatically removed at intervals and new filter aid automatically added to replace the quantity scraped off.

As used in cleaning up electroplating baths, rotation of the drum occurs only at times when electrical controls indicate an increase in pressure drop due to accumulation of solids in the precoat layer. When this occurs the drum revolves against a blade set at the top to remove the spent filter aid layer, which is transported up a ramp and dropped to a disposal container. Immediately back of the blade is a slurry chamber in which the filter aid is received from the hopper above and diluted with fresh solution from the plating-tank. The aid deposits itself on the drum in the small segment exposed to the chamber.

Presumably this arrangement could also be used in a variety of polishing applications on chemical and pharmaceutical solutions. However, in cases where a larger quantity of solid was to be removed, the system should be adaptable to continuous rotation of the drum, with continuous removal and replacement of the spent precoat material.

In the accompanying view, showing an experimental model for cleaning plating solutions, the dirty solu-

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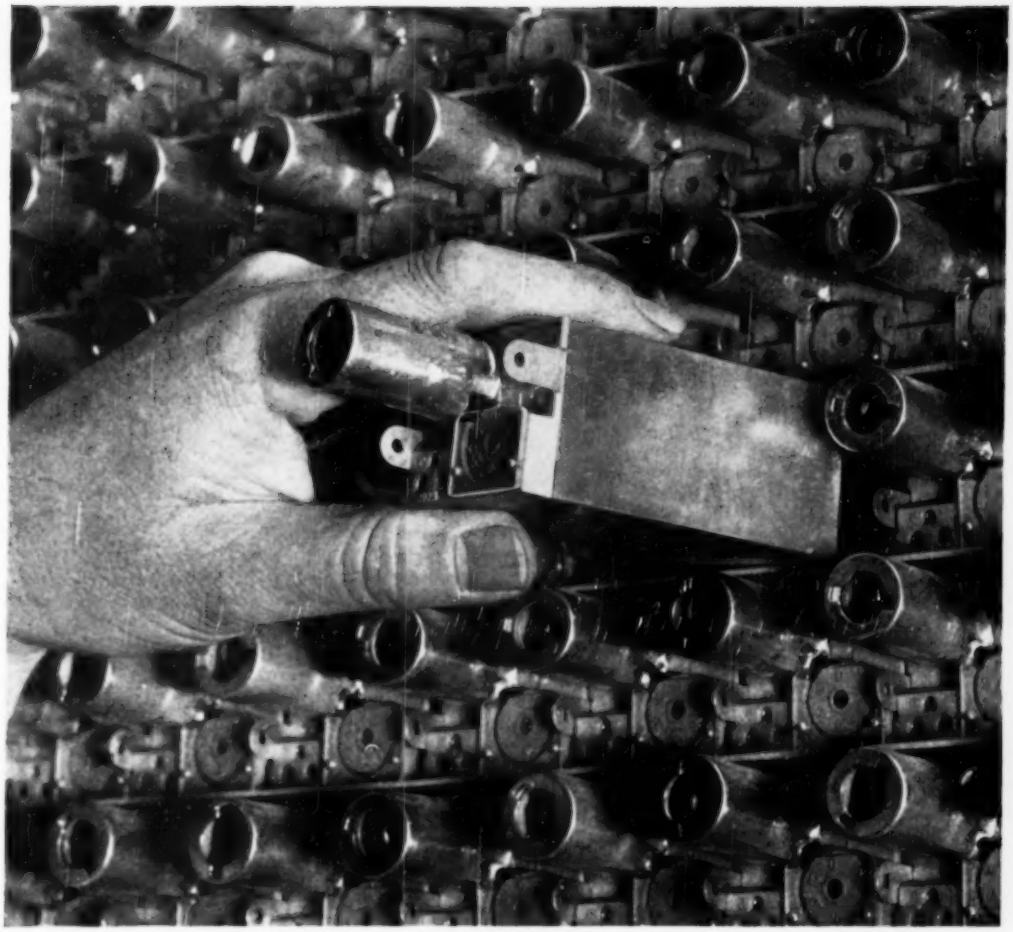


ANOTHER SCORE IN THE

battle of the inches

It takes many costly buildings to house your telephone system. Every inch saved helps keep down the cost of telephone service. So at Bell Telephone Laboratories engineers work constantly to squeeze the *size* out of telephone equipment.

In the picture a new voice frequency amplifier is being slipped into position. Featuring a Western Electric miniature vacuum tube, tiny permalloy transformers, and special assembly techniques, it is scarcely larger than a single vacuum tube used to be. Yet it is able to boost a voice by 35 decibels. Mounted in a bay only two feet wide and 11½ feet high, 600 of the new amplifiers do work which once required a *room* full of equipment.

This kind of size reduction throughout the System means that more parts can be housed in a given space. Telephone buildings and other installations keep on giving more service for their size – and keep down costs.

The new amplifiers, which will soon be used by the thousands throughout the Bell System to keep telephone voices up to strength, are but one example of this important phase of Laboratories' work.

BELL TELEPHONE LABORATORIES EXPLORING AND INVENTING, DEVISING AND PERFECTING, FOR CONTINUED IMPROVEMENTS AND ECONOMIES IN TELEPHONE SERVICE

Whatever your hazard,

PYRENE'S the buy!

VAPORIZING LIQUID

The all-purpose extinguisher effective on almost every kind of fire. Sets on electrical fires, too. 1 qt. and 1½ qt. pump types; 2 qt. and 1 gal. pressure-operated types.

MANUAL AND AUTOMATIC SYSTEMS

Complete fire-fighting systems, using chemical foam or air foam. For storage tanks, dip tanks, loading racks, etc.

AIR FOAM

Couple Playpipe to hose line. Every 15 gals. of water and 1 gal. of PYRENE Foam Compound yield 250 gals. of foam! For flammable liquids and ordinary combustibles.

CARTRIDGE-OPERATED

Eliminates annual recharging. For fires in wood, paper, textiles. Shoots water or anti-freeze solution. 2½ gal. size.

Also Soda Acid, Pump Tank, Chemical Foam, and other extinguishers.

THERE'S A PYRENE* for every fire hazard... and there are PYRENE jobbers in all principal cities. You can order all your extinguisher needs—the reliable, prompt, economical, easy way—from one local establishment. You can do it on one purchase order. You get immediate delivery by the jobber, and you don't have to pay freight charges from the factory.

The name PYRENE stands for precision-made, time-tested products. Your fire extinguishers can mean the difference between a moment's excitement and a burned-out plant. Don't settle for less than PYRENE quality! Write for name of your local PYRENE jobber.

*T.M. Reg. U.S. Pat. Off.

PYRENE MANUFACTURING COMPANY

593 Belmont Ave. Newark 8, N.J.

Affiliated with C-O-Two Fire Equipment Co.

tion passes from process tank (1) to filter tank (2), through the filter and back to the process tank by means of pump (3). The spent filter aid is removed from the drum at (8), while fresh material is metered from container (5) to make-up tank (6), and passed to the drum.

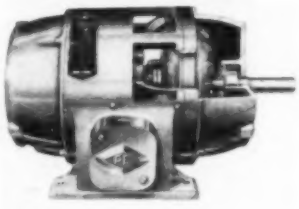
Commonwealth Engineering Co. of Ohio, Dayton 3, Ohio.

SHEATHS TANKS:

Insulation Protector

A new method for protecting the insulation on outdoor tanks and vessels has been developed by Johns-Manville. The method consists in applying any standard insulation suitable for the temperature of use over the surface of the tank and then adding as a weather and corrosion-resistant covering sheets of this company's Asbestocite. This sheet material, made of asbestos and cement in sheets 4 × 8 ft. × ⅛ in., can be readily bent to fit curved contours and secured over the insulation. It needs no preservative treatment and is said to be practically maintenance-free, protecting the underlying insulation against weather conditions of all kinds.

Johns-Manville, 22 East 40th St., New York 16, N. Y.



NO OVERLOADS:

Fluid Drive Motor

Integral construction of an electric motor and direct-connected fluid drive is found in a recently announced Reuland Electric product. Because of the integral arrangement, the combination is lower in cost and several

(Continued)

OPERATES WITH EASE

Cylindrical Plug Valve

Quick turning is an outstanding advantage of a.C.f. design. No wedging in its seat. The precision-machined Cylindrical Plug, pressure lubricated on all seating surfaces is always free to turn. It could be critically important in your plant. Reason enough to give a.C.f. Lubricated Plug Valves preference.

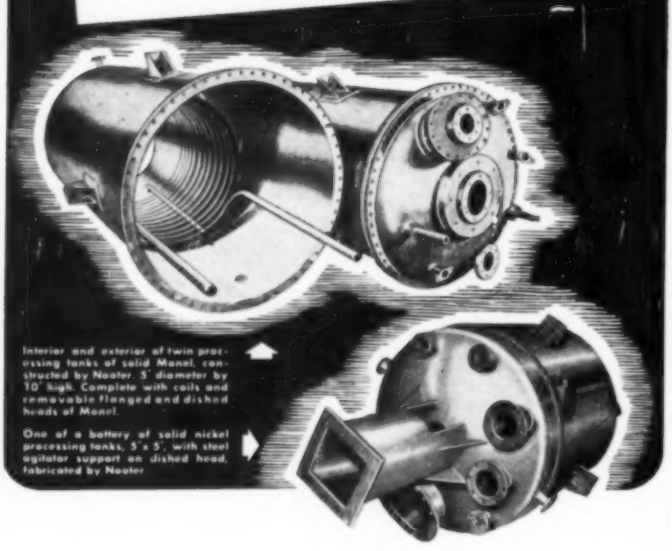
a.C.f. CYLINDRICAL FULL PIPE AREA LUBRICATED **PLUG VALVES**

Representatives in more than 50 Principal Cities.

Ask for catalog 4-CM American Car and Foundry Company, Valve Division, 30 Church Street, New York 8, N. Y.

THE RIGHT COMBINATION FOR BETTER FABRICATION

NICKEL+NOOTER



Interior and exterior of twin processing tanks of solid Monel, constructed by Nooter. 5' diameter by 10' high. Complete with coils and removable flanged and dished heads of Monel.

One of a battery of solid nickel processing tanks, 5' x 5', with steel agitator support on dished head, fabricated by Nooter.

You specify a specific metal *because* you know it has the *properties* needed for the job to be done. Now how about the fabrication of that metal so that those vital properties will be preserved and used to best advantage? That very question is what brings Nooter on the job! Making metals behave and do what they are supposed to do has been Nooter's specialty for over 50 years.

Call in Nooter at the blue print stage—for safe, accurate fabrication of your processing vessels.

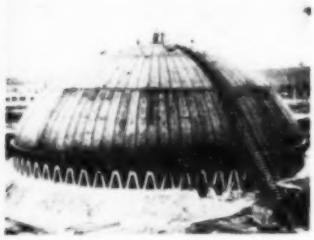
NOOTER

Send for your copy of "Tank Fabrication for Industry" and Corrosion-Data Charts.

NOOTER CORPORATION • 1422 S. Second St., St. Louis 4, Mo.

inches shorter than a combination of separate motor and fluid drive. Motors of this type are suitable wherever loads require smooth acceleration, protection from jamming and shocks, or are difficult to start. Typical installations include conveyors, extractors, crane drives, winders and mixers. Since the motor comes practically up to speed before the load is applied, motors can be selected closer to actual horsepower requirements and thus operate more efficiently. There is also a current saving due to reduction in starting current. Available sizes range from ½ to 10 hp. Integral singe- or double-reduction type reducers can also be provided.

Reuland Electric Co., Alhambra, Calif.



SAVES STEEL:

Spheroidal Tank

A method of construction for large liquid-containing tanks, developed in France by A. Caquot, is now available in the United States. The design is particularly suitable for volatile liquids such as hydrocarbons, since it is capable of operating at pressures as high as 5 psig., said to be more than sufficient to handle evaporation losses due to breathing. The spheroidal design is theoretically the most economical in its use of metal since the shape is that assumed by a drop of liquid on a flat plate, which means that the wall stresses are at a minimum considering the weight of the contained liquid. Tanks of this character are built in sizes ranging from 7,000 to 180,000 bbl.

The tank is constructed by butt welding flat plates laid on sand to form a slightly concave bottom. A fabricated ring girder is then erected around the bottom, supported on steel members carried on a concrete footing. A "tub" section of curved plates joining the bottom to the girder is then welded on, after which a temporary scaffolding is erected inside the tank from which the several rings of plates forming the upper section are

(Continued)

Diversified High Temperature Processes at

McDANEL REFRACTORY PORCELAIN CO.

Emphasize Controllability of

GAS

Above: Rear view of furnaces showing firing ports; workman checks on high temperature GAS firing system.
Below: Saggers filled with porcelain parts enter furnace on car.

INDUSTRIAL PORCELAINS take a lot of rough treatment in many applications in iron, steel, chemical, drug, and paint manufacturing. To withstand these critical operating conditions refractories must be fired at high temperatures and under precise control.

At McDanel Refractory Porcelain Company, Beaver Falls, Pennsylvania, the industrial porcelains are fired in special Gas Furnaces. In this application GAS provides firing temperatures up to 3100° F. But the really important feature of these Gas Furnaces is the automatic controllability of the fuel for firing products at 2250°, 2300°, 2900°, or at any other temperature required in heat processing.

The wide variety of McDanel Industrial Porcelains necessitates the use of several types of furnaces, and certain units are arranged in batteries for more efficient operation. Flexible GAS serves in all of these, providing accurately controlled time-temperature cycles in—

9 Car Type Kilns **2 Bottle Type Kilns**
16 Hitemp Tube Furnaces **2 Drying Ovens**

President Donald W. McDanel pointed out that McDanel Industrial Porcelains have been fired by GAS since the company was founded in 1919. Mr. McDanel expressed his preference for Gas-fired Ceramic Furnaces in these words, **"Our porcelain products require precise temperatures and GAS gives us the automatic controllability necessary for firing pyrometer tubes, combustion tubes, insulators, grinding balls, mill linings and special research refractories. Beside that, GAS is economical and its cleanliness simplifies our plant housecleaning."**

That's the sort of reputation GAS has established in thousands of plants where heat processing is a production-line operation, and Gas Equipment serves as an efficient productioneering tool.

AMERICAN GAS ASSOCIATION

420 LEXINGTON AVENUE, NEW YORK 17, N.Y.

Here's a Tip...

for selecting the *RIGHT VALVE* for the *RIGHT PLACE*

If you just want an extra good valve for general service, then choose the "Renewo" with Regular Type Nickel Alloy Seat and Disc. It's tops in its class.

Or, perhaps you have a throttling condition such as drain, drip, water column blow-down and like service where regular seats and discs tend to cut out . . . use the "P" (Plug Type) "Renewo" with 330 Brinell "NS 5" Alloy Seat and Disc. Here you have high resistance to wear and corrosion.

And for severe throttling and erosive service, particularly where abrasive conditions are present . . . the "PS" (Plug Type) "Renewo" with 500 Brinell Stainless Steel Seat and Disc will solve the problem.

"Renewo" Globe Valve Regular Type, "P" Type or "PS" Type

LUNKENHEIMER "RENEWO" VALVE *Threesome*

1. REGULAR TYPE *"Renewo"* Nickel Alloy Seat and Disc for general service.

2. "P" (PLUGTYPE) *"Renewo"* "NS5" Nickel Alloy 330 Brinell Seat and Disc for throttling, drain, drip, water column blow-down and like service.

3. "PS" (PLUG TYPE) *"Renewo"* Stainless Steel 500 Brinell Seat and Disc for close throttling and other severe erosive service.

and look at these money saving extra features

1. Each type of seat and disc is interchangeable one with another, making it possible to convert a regular type valve into a plug type without taking the valve out of the line.

2. Available in 200 lb. S.P. as well as 300 lb. S.P. making it unnecessary to purchase a 300 lb. valve for 200 lb. service.

The "Renewo" Threesome is fully described in Circular No. 577. A copy is yours for the asking . . . from your Lunkenheimer Distributor or direct from us.

ESTABLISHED 1862

THE LUNKENHEIMER CO.

—QUALITY—

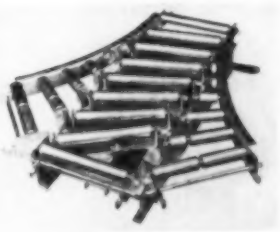
CINCINNATI 14, OHIO, U.S.A.

NEW YORK 13 · CHICAGO 6 · BOSTON 10 · PHILADELPHIA 34

EXPORT DEPT. CINCINNATI 14, OHIO, U.S.A.

welded on, one ring after another, until finally the structure is closed at the top by the addition of a dome.

Caquot Tank Corp., 45 East 68th St., New York 21, N. Y.

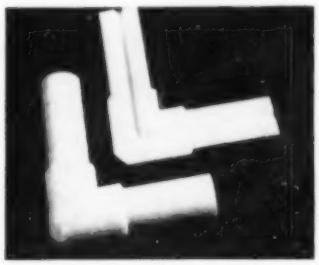


THREE-WAY OPERATION:

Conveyor Switch

For use in light-weight roller or wheel conveyor lines, a new Standard switch is available permitting conveyed packages to move either straight ahead or to either the right or left at an angle of 45 deg. The switch consists of a series of pivoted straight rollers forming the central or main line which can be manually turned to right or left to divert the load, or set straight ahead for straight-through travel. Control is possible from either side of the switch. When turned for deflecting to either side, the rollers always remain in a true radial position, providing the carrying effect of a regular curve with rollers radially mounted.

Standard Conveyor Co., 10 Indiana Ave., North St. Paul 9, Minn.



LIGHT-WEIGHT:

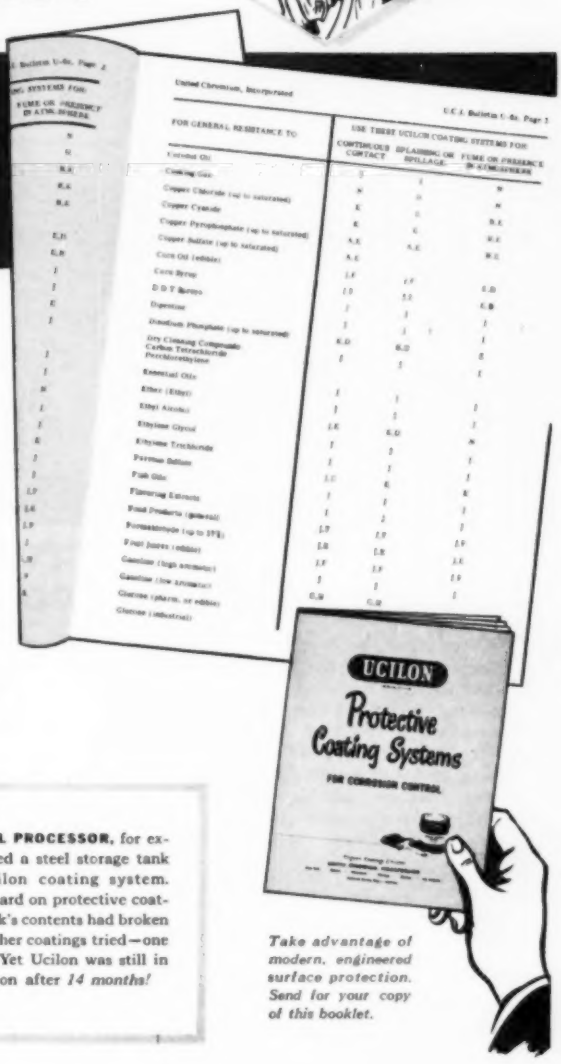
Plastic Insulation

Made of Dow Chemical Co.'s Styrofoam, an expanded plastic containing thousands of minute closed-wall cells, a new cold insulation suitable for both pipes and vessels has been introduced under the name of K-Shield. The material weighs only 1¼ to 1½ lb. per cu.ft. It is rigid, serves as its own moisture barrier, and is highly resistant to mold growth, rot and decay.

(Continued)

Are your CORROSION troubles listed here?

Control them systematically with UCILON Protective Coatings and the help of this booklet

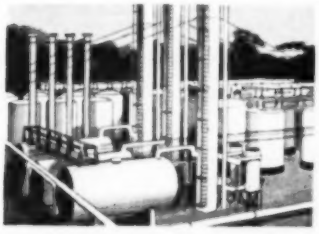


Users of Ucilon coatings are acclaiming this systematic method for controlling corrosion as they report getting longer life from equipment plus lower maintenance costs. It may be the practical answer to your own problem.

First, we send you this 32-page booklet. It lists common agents responsible for failures of ordinary paints and the subsequent corrosion of equipment. For each of the 153 agents listed, it presents a recommended system of Ucilon protective coatings for use against the specific trouble—one which has proved it can lick the corrosion problem to a "standstill." There are systems that resist acids, alkalies, salts, oils, water, organic materials.

You choose the best system for your application, and by so doing you automatically select the required coatings from the complete Ucilon line. Then follow the complete instructions for carrying out the system.

See what a big difference such a systematic approach to corrosion control can make in your plant. You'll learn why Ucilon Systems succeed so often where other coatings fail.



A CHEMICAL PROCESSOR, for example, coated a steel storage tank with a Ucilon coating system. Especially hard on protective coatings, the tank's contents had broken down two other coatings tried—one in 6 weeks. Yet Ucilon was still in good condition after *14 months!*

Take advantage of modern, engineered surface protection. Send for your copy of this booklet.

UCILON Protective Coatings

Reg. U.S. Pat. Off.

UNICHROME products of UNITED CHROMIUM, INCORPORATED

51 East 42nd St., New York 17, N. Y. • Detroit 7, Mich. • Waterbury 90, Conn. • Chicago 4, Ill. • Dayton 2, Ohio • Los Angeles 13, Cal.

Tighten Up ON WATER COSTS

Install a Deming Turbine

In your search for lower costs, don't overlook the possibility that your company may have an excellent underground source of water which could be made available for general water supply at low cost. In many instances, the combined costs of drilling the well and installing a Deming Deep Well Turbine Pump have proved to be LESS THAN THE COST OF "CITY WATER" FOR ONE YEAR! As Deming Turbine Pumps are built to last for many years, you can see why more and more plants are reducing their water costs by the simple method of owning their own water supply. For more details, you may wish to save time by filling in the form below and mailing to us.

THE DEMING COMPANY • 525 BROADWAY • SALEM, OHIO

Please send copy of BULLETIN 4700-B.

name

company

address

DEMING
THE COMPLETE LINE
PUMPS AND WATER SYSTEMS

Claimed to be cut easily with ordinary tools, it is readily applied in applications ranging from plus 175 to minus 275 deg. F. It is produced for all standard pipes and fittings, and can be custom fabricated to specifications for insulating process equipment of many types.

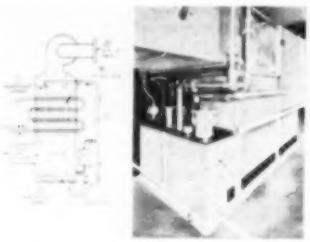
Robinson Industries, Coleman, Mich.

VOICE-POWERED:

Industrial Telephone

No outside source of power is necessary for a new line of sound-powered telephones for industrial use which are capable of operating up to 30 miles. Standard construction is weatherproof and dustproof, while Bureau of Mines approved stations for use in explosive atmospheres are also available. Each station consists of a sound-powered telephone handset mounted on an aluminum case. A magneto in the case operates a howler unit to signal at the receiving end. Up to 24 stations can be used with selective-ringing systems, or an unlimited number of non-selective ringing stations.

United States Instrument Corp., 409 Broad St., Summit, N. J.



ABSORBENT SYSTEM:

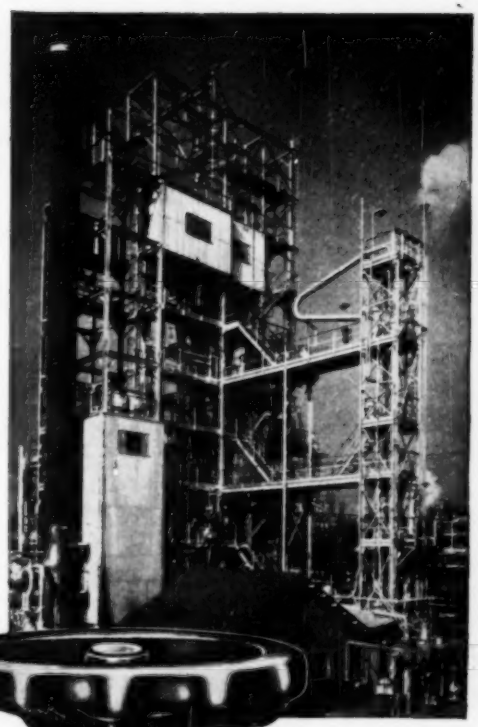
Frost Preventer

Kathene, the lithium chloride based absorbent used in the Surface Combustion Kathabar humidity control system, is employed in a simple fashion to prevent frosting of low-temperature cooling surfaces, according to a recent announcement. Since moist air cannot be prevented from condensing moisture when cooled below its dew point, frost ordinarily will form on the cooling coils. However, spraying the coils with the Kathene solution causes the solution immediately to take up condensed moisture. The solution then drips into a sump from which the bulk of it is recirculated over the coil, while the remainder passes through a regenerator to remove the accumulated moisture. Ordinarily only about 10

(*Continued*)

In Laboratories and in Gas Synthesis Plants

EACH day more of the major projects in the petroleum industry prove that OIC *sets the pace in valves!* Included in recent large-scale installations is one of the industry's leading research laboratories that deserves the highest commendation for its contributions to synthetic rubber and other developments. Part of this operation is this twelve-story Gas Synthesis pilot plant, designed to play a vital part in the research and development of synthetic gasoline.

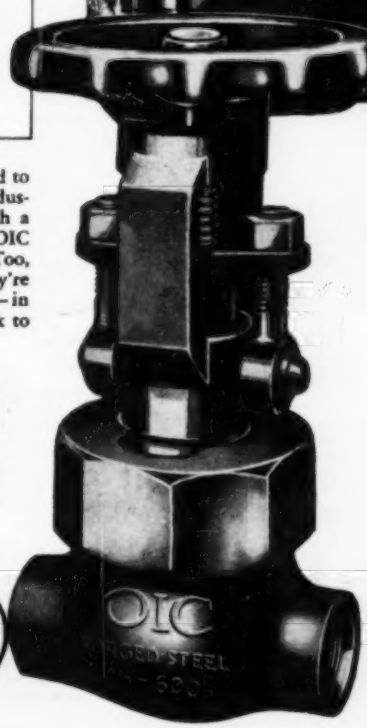


OIC
SETS THE PACE IN VALVES

Yes, OIC Valves are *precision* valves, designed to meet every requirement of the petroleum industry. Streamlined for free and easy flow with a minimum of pressure-cutting turbulence, OIC Valves keep pressures *up* and costs *down*. Too, there's an extra margin of safety, for they're built to provide maintenance-free service—in heaviest use. And for leakproof closures, look to OIC . . . Pace-Setter in Valves!

NEW OIC FORGED STEEL VALVE CATALOG NO. 48FS NOW READY

It's made to fit inside your big 235-page OIC Catalog. You'll have *all* the valve information you need right at your fingertips. For your free copy, just write, giving your name, firm and address to The Ohio Injector Company, Wadsworth, Ohio.



OIC
VALVES
IRON • STEEL • BRONZE

BENDIX FRIEZ

FOR BETTER PRODUCTION...

KEEP POSTED on RELATIVE HUMIDITY and TEMPERATURE

...two important factors in your plant operation about which too little is usually known.

The productive capacity and efficiency of workmen . . . the condition of raw materials . . . the operation of machines—all these are affected by temperature and humidity. Modern weather instrumentation keeps you posted on these two important factors . . . gives you day-to-day records to match against production . . . shows you what to do and *when* to do it. And modern instrumentation means Bendix-Friez—manufacturer of the world's finest meteorological instruments and suppliers to the United States Weather Bureau. Write for details of the way weather instruments can help you.

BENDIX-FRIEZ
Portable Humidity and Temperature Recorder, Model 160
3" x 5" charts, 8 or 30 hour records. Modern design . . . handy for small space and difficult locations . . . built to meet unusual conditions.

BENDIX-FRIEZ
Hygrothermograph, Model 594
The foremost relative humidity recorder for laboratory, factory, and office use. Scientifically designed for accuracy and dependability.

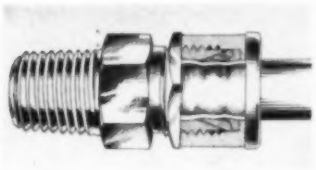
FRIEZ INSTRUMENT DIVISION of
1390 Taylor Avenue
Baltimore 4, Maryland

Bendix AVIATION CORPORATION

Export Sales: Bendix International Division, 72 Fifth Avenue, New York 11, N. Y.

percent need be regenerated. Low pressure steam is used for this purpose, with electric power required for the circulating pump and blower.

Kathabar Division, Surface Combustion Corp., Toledo 1, Ohio

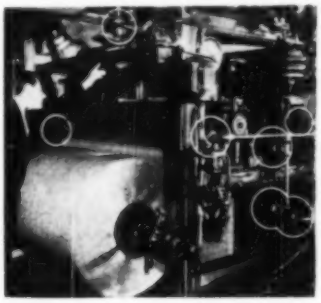


THREE-POINT SEAL:

Clinch Type Fitting

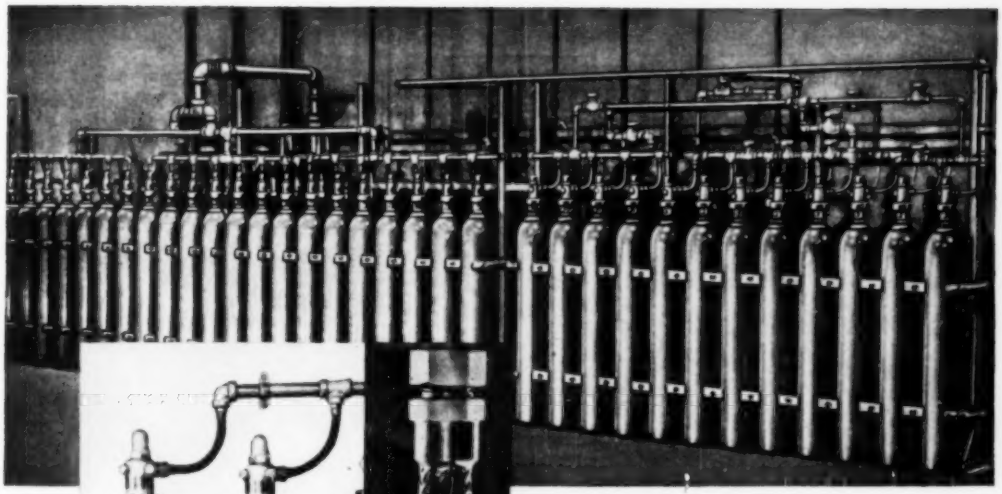
Swagelok is the name of a new clinch-type fitting for any type of metal or plastic tubing which has recently received exhaustive service tests in actual chemical, power and other industrial service. The novel feature is the provision of seals at three points through the use of two ferrules and a threaded chuck clamp around the tube. The seal produces virtually no effect on the inner walls, yet tests are said to show that the tubing will burst before leaking occurs. The construction is said to minimize fatigue effects from vibration. Instal-

(*Continued*)

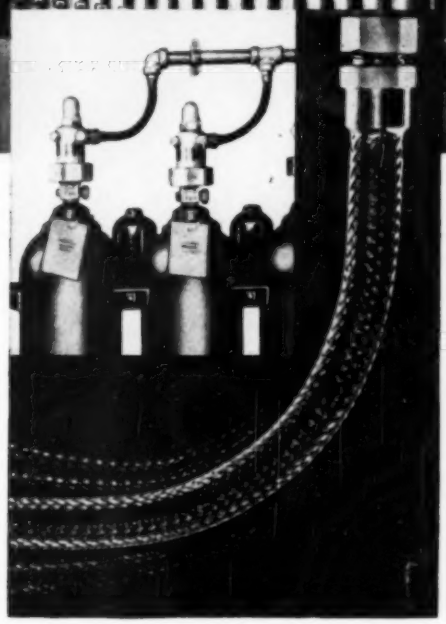


PROTECTION BUILT IN

In impregnating Nylon tire fabric with rubber, the rubber cement used contains a high percentage of flammable solvent so that Firestone Tire & Rubber Co., Akron, called in Kidde engineers to design a built-in protection system. The 20 Multi-jet discharge nozzles, located at hazard points throughout the machine, are manifolded to four 50-lb. cylinders of liquid carbon dioxide. The system is set off by two heat actuators, one at each end of the machine. Actuation of the system also cuts off power and closes certain duct dampers automatically. *Walter Kidde & Co., Belleville, N. J.*



66-cylinder installation of the C-O-Two Fire Equipment Company's extinguishing equipment at Bonneville Dam Power Plant. Each cylinder is connected to the manifold by means of a flexible connector made with American ¾" I. D. Bronze Tubing (seamless bronze with two braids). Photos courtesy C-O-Two Fire Equipment Company, Newark 1, N. J.



They wanted these cylinder connections simple . . . and safe

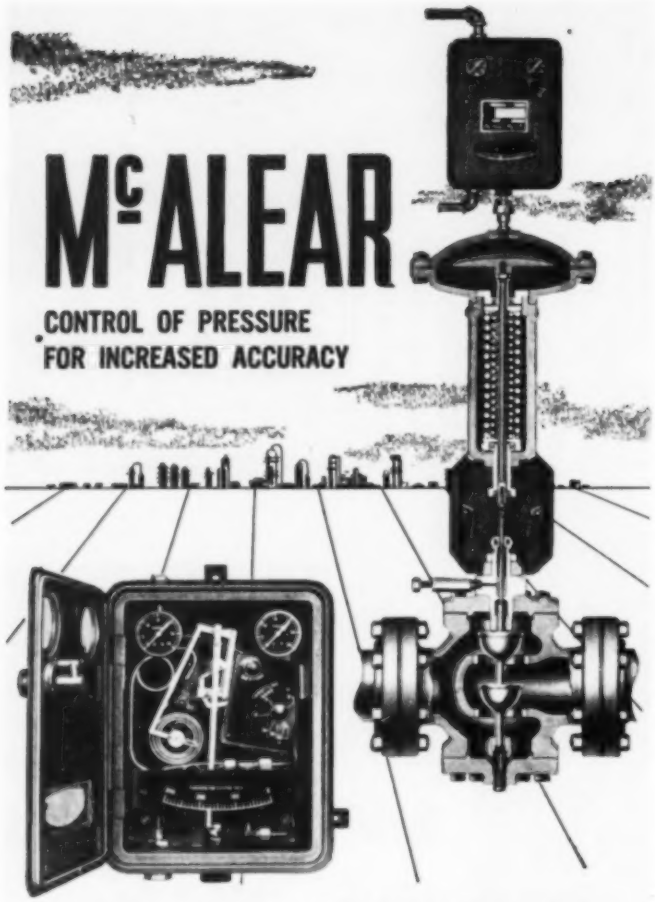
So they used American Seamless Flexible Metal Tubing for the 66 manifold connectors in this installation. Couplings swing freely and accurately into line. No struggling with rigid or semi-rigid pipe or tube.

Resists corrosion, heat and cold; minimizes vibration. American Seamless Flexible Metal Tubing can be flexed thousands of times with no danger of failure—carries thousands of pounds pressure safely. For flexible metal hose or tubing designed for use with almost any gas, vapor, liquid, or even semi-solid, consult The American Brass Company, American Metal Hose Branch, Waterbury 20, Connecticut. In Canada: The Canadian Fairbanks-Morse Company, Ltd.

ANACONDA
from mine to consumer

wherever connectors must move . . . ***American***

FLEXIBLE METAL HOSE AND TUBING



These McAlear units offer a completely coordinated "package" for installation wherever sensitivity of control is required.

McAlear No. 115 and No. 116 Diaphragm Motor Valves—Equipped with ball bearings and multiple springs. No. 115 is spring opened and pressure closed while No. 116 is spring closed and pressure opened. Available in semi-steel or cast steel, or other metals, suited to various pressures, temperatures and services. Sizes from ½" to 12".

McAlear No. 1500 Pilot — Employs spiral sensitive spring which reduces hysteresis to minimum. Adjusted or converted to reverse action without use of tools. Indicator shows controlled pressure. May be mounted on valve or remotely (surface or flush) without alteration. Full range of operating pressures available. Write for Bulletin No. 150.

McALEAR Mfg. Co.
1907 SOUTH WESTERN AVENUE
CHICAGO 8, ILLINOIS

McALEAR controls for STEAM WATER AIR OIL-GAS

REPRESENTATIVES IN PRINCIPAL CITIES

AN INDEPENDENT MANUFACTURER FOR OVER 40 YEARS

NEW EQUIPMENT, cont. . .

lation is simple, involving merely slipping the Swagelok over the end of the tube and giving it 1¼ turns with any standard wrench. No torque is transmitted to the tube during this tightening operation. Fittings are available in various materials, including brass, aluminum, stainless steel and Monel metal. All usual fittings for tubing sizes from ¼ to 1 in. O.D. are available.

Crawford Fitting Co., Cleveland 17, Ohio.

Briefs . . .

ROTARY PUMPS. New stainless steel rotary pumps of non-agitating characteristics, which can be quickly disassembled for cleaning and will handle materials ranging from solvents to extremely viscous products, are now available. The new design features the use of a rotating Teflon seal. *Waukesha Foundry Co., Waukesha, Wis.*

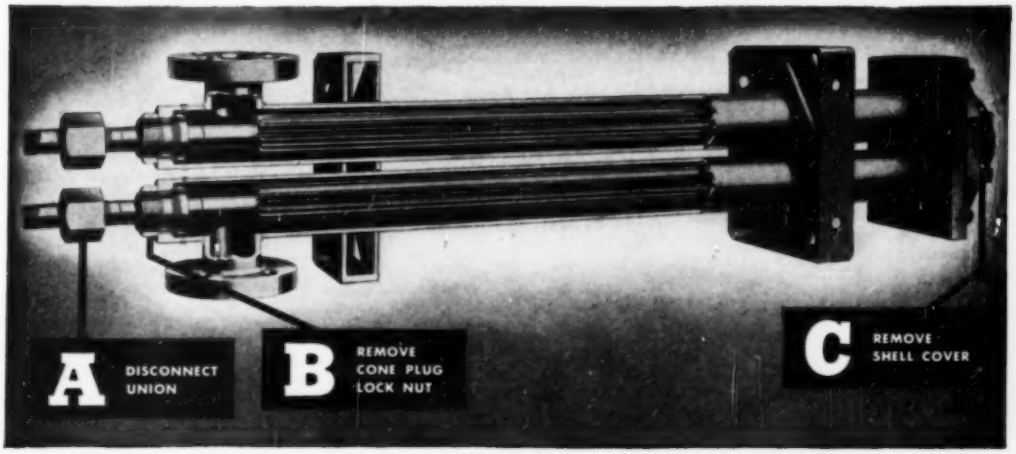
RESISTANT GLOVE. For hand protection at either high or low temperatures, a new Pioneer glove of red neoprene, having an insulating lining of several layers of wool fleece, is now on the market. Tests have shown usability between minus 85 and plus 314 deg. F. At 12 deg. F. no discomfort was found by the testers after 30 min. of constant immersion. *The Pioneer Rubber Co., 1939 Tiffin Road, Willard, Ohio.*

PROGRESS DETECTOR. A novel method of detecting the progress of the underground gasification experiments at Alabama Power Co.'s Gorgas Mine consists in using a GE electronic mercury vapor detector which monitors the gas output stream. Before the vein was fired, small capsules of mercury were placed throughout the vein at intervals in the path of the blaze. Whenever the combustion zone reaches a capsule, the mercury vaporizes and the instrument detects the fact. *General Electric Co., Schenectady, N. Y.*

PUMP VALVES. For reciprocating pumps handling non-abrasive fluids, a new valve is now available for operating temperatures to 300 deg. F. and pressures to 750 psi. The seat and spring are of bronze alloys and the valve plate of special phenolic plastic. For higher temperatures, a similar all-metallic construction is available. The light phenolic valve plate is free tilting and causes little resistance to suction flow. Spring design permits

(Continued)

as easy as A B C



Convenient Withdrawal of Heat Transfer Elements...one of many **TWIN G-FIN SECTION** *Advantages*

When you want to withdraw the heat transfer element of a G-R Twin G-Fin Section for inspection or cleaning, you need only remove 3 parts. No other heat exchanger has this advantage.

And this simplicity is typical of the Twin G-Fin Section. Its *design* is simple . . . it consists essentially of a pipe within a pipe . . . no tube sheets, no baffles, no internal joints to keep tight. Its *installation* is simple . . . these light-weight standard interchangeable units are readily handled; are easily stacked and connected in series or parallel for the desired capacity and temperature ranges. Its *maintenance* is simple . . . the operating records of more than 40,000 units, some of them in service for more than 15 years, have conclusively proven its durability and low upkeep cost.

Whatever may be your heat transfer requirements, investigate this universal heat exchanger . . . used on a greater variety of condensing, cooling and heat exchanger services than any other design of apparatus.

THE GRISCOM-RUSSELL CO., 285 MADISON AVENUE, NEW YORK 17, N. Y.

Write for Bulletin 1614, describing the many advantages and applications of the G-R Twin G-Fin Section.

GR—191

GRISCOM-RUSSELL

Pioneers in Heat Transfer Apparatus

2 SURE-FIRE WAYS TO CUT EQUIPMENT COSTS

with PERMACLAD

STAINLESS CLAD STEEL

Truly corrosion resistant!
Easily formed or deep drawn!

Whether you buy or build vessels for Chemical or Food Processing Plants, PERMACLAD gives you dual savings. You save on corrosion resistance because PERMACLAD has the surface characteristics of stainless steel. And you save on forming costs because PERMACLAD's backing is easily-drawn mild carbon steel.

As a matter of fact, many parts can be formed from PERMACLAD which cannot be formed from certain other corrosion resistant materials. You can subject PERMACLAD to a considerably deeper draw without intermediate annealing. Yet, regardless of the severity of the draw, the percentage of cladding remains unchanged.

For most needs, standard PERMACLAD (10% cladding) is suitable. But where conditions require additional cladding, the percentage can be increased to 20% or more. For less expensive, longer-lasting, corrosion resistant products and equipment, design and build with PERMACLAD. The coupon below brings you detailed information and a copy of our free 8 page folder.

The Finer The Finish • The Finer The Product For The Finest Finish Use PERMACLAD

PERMACLAD

STAINLESS CLAD STEEL

A Product of ALAN WOOD STEEL COMPANY

Dept. 22 Conshohocken, Pa.

Gentlemen:

Please send me detailed information regarding PERMACLAD, without obligation, also a copy of your free 8 page folder.

*Name*_____ *Title*_____

*Company*_____ *Address*_____

*City*_____ *State*_____

OTHER PRODUCTS: A-W Algrip, Abrasive Floor Plate • A-W Super-Diamond Floor Plate • Billets • Plates • Sheets (Alloy and Special Grades)

greater valve lift. *American Iron & Machine Works Co., 515 North Indiana St., Oklahoma City, Okla.*

DRUM HANDLER. From one to four drums or barrels can be picked up and handled simultaneously with a new Hyster load-grab attachment for this company's fork trucks. The drums are lifted either horizontally or vertically by hydraulic pressure. If the lifter arms are installed on a revolving load grab, the arms can be used to turn over or dump drums or barrels. The arms can be quickly and easily exchanged for other types to permit the truck to carry out a variety of jobs. *Hyster Co., 2902 Northeast Clackamas St., Portland 8, Oregon.*

EYE WASHER. For first-aid treatment of eyes following splashing of chemicals, industrial doctors advise immediate washing with plenty of running water. For this purpose there is a new eye washing fountain which is operated simply by placing the face over the bowl so that the forehead contacts the valve button, starting two steady soft streams of water which flow into both eyes. *Industrial Products Co., 2820 North Fourth St., Philadelphia 33, Pa.*

LEVEL CONTROLLER. A simple method of level control recently developed consists in installing a finger-like tube in the bottom of a tank, extending to the tank top. Over this a stainless steel ball with central passage, which contains a circular permanent magnet, is fitted. Inside the finger is another permanent magnet carried on a wire lead which indicates level of the liquid outside the tank and also operates a solenoid valve for filling the tank. *American Machinery Corp., Orlando, Florida.*

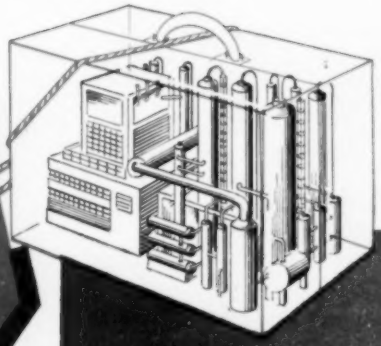
CARBON BRICK. A new large size of carbon brick offered by National Carbon facilitate installation through having fewer joints to cement. The new size is $13\frac{1}{2} \times 6 \times 3$ in., weighing 14.4 lb. A new key brick of comparable dimensions and a new straight and key or somewhat smaller size are also being produced. *National Carbon Co., Room 1328, 34 East 42nd St., New York 17, N. Y.*

Correction: On p. 154 of our September issue the name of the manufacturer of the portable propeller mixer described there was incorrectly stated. The manufacturer of this mixer is United Electric Motor Co., 178 Centre St., New York 13, N. Y.—*End*

Wigton-Abbott Corporation

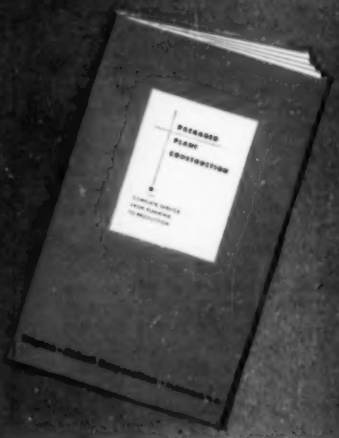
builds COMPLETE PLANTS*

"PACKAGED PLANT CONSTRUCTION"
a Complete Service from PLANNING to PRODUCTION



Yours for the Asking

Reading time, only 10 minutes —but it will save time and money by answering basic questions regarding this new concept in plant construction.



Whether the problem involves construction of facilities designed from pilot plant data, the development of new processes from flow sheets, or the expansion of present plant facilities, Wigton-Abbott Corporation "Packaged Plant Construction" offers the most economical and efficient solution in the shortest time.

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Wigton-Abbott Corporation

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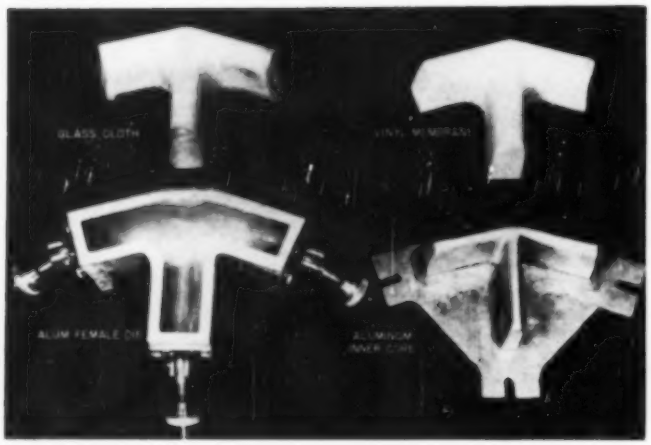
New Products and Materials

JOSEPH A. O'CONNOR, News Editor



Vinyl Membrane Made From Thermoplastic Acts As Flexible Mold in Forming Glass Fiber Parts

Promising thermoplastic compound developed by the Western Coating Co. is Westoflex. When fused for a few minutes at about 350 deg. F. it forms a tough, rubber-like coating that is dimensionally stable and that withstands high-voltage current, exposure to petroleum products, corrosion and chemical attack. Among industries eyeing Westoflex with interest are the electroplating, metal working, metal finishing, aircraft, plastics, process equipment and chemical industries.

Aircraft companies are experimenting with the material as the possible answer to the problem of rain erosion on certain exterior parts of high-speed planes. It is thought that a smooth, flexible surface may better withstand the battering that high-speed planes take in passing through rain squalls.

A most interesting and important use of Westoflex is as a flexible mold for the formation of Fiberglas parts. A special formulation gives this material permanent lubrication to aid in the parting of the finished glass laminate from the molding material. North American Aviation, Inc., at Inglewood, Calif., has been experimenting in this work. A vinyl membrane, made by curing Westoflex, provides a flexible mold for the formation of the glass-fiber parts (see cut). This process will save the aircraft industry alone hundreds of thousands of dollars a year. And Westoflex can help cut costs in other industries.

Westoflex is non-flammable. It will not crack at −20 deg. F. Nor will it soften at temperatures up to 400 deg. F. Chemically inert, it resists such corrosives as nitric, sulphuric and chromic acids, as well as strong alkalis. It is not affected by oxidation.

In the chemical industries Westoflex finds its biggest use as a protective lining or coating for process equipment. It is highly effective in contact with dye liquors, sulphite liquors, corrosive chemicals, corrosive atmospheres, sweet and sour refinery crudes, oxidizing and reducing gases up to 400 deg. F., and fresh, salt and mine water, as well as saline water containing hydrogen sulphide.

Westoflex can be formed or applied by extruding, casting, low-pressure molding, spraying, brushing, dipping or spreading. Fusion occurs after heating at about 350 deg. F. for approximately 20 min.

Western Coating Co., 85 West Union St., Pasadena 1, Calif.

This Month . . .

Be sure to read about these big new product developments on following pages . . . If you are after a solvent for resins, check on diallyl cyanamide, p. 160. Its reactions with water, amines, alcohols and hydrogen sulphide are worth investigating . . . See p. 160 to learn how compounds related to Cortisone are being synthesized from soybean . . . Fine particle size of a new hydrated silica, p. 162, will be a boon to compounders of rubber and vinyls . . . For a pair of alanine derivatives, one with possibilities as an intermediate, the other with surface-active properties, see p. 162 . . . Maybe the new direct acetate brown, p. 164, is the dyestuff that will solve your shading problems . . . And on p. 166 you will learn about a whole raft of organic fluorides that can be used as thermoplastic intermediates.

Next Month . . .

Here are a few of the new products that we will unveil next month . . . There is a free-flowing titanium dioxide for vitreous enamels and other ceramics that can be mixed dry . . . A group of aromatic materials have been developed to eliminate or mask plasticizer odors . . . A resin binder for sand cores and dry molds has been introduced.

INTERMEDIATE:

Ethyl Trifluoroacetate

As a result of special research in the past few years, the Dow Chemical Co. has come up with a manufacturing process for the production of ethyl trifluoroacetate. Experimental quantities of the new chemical can now be secured.

A colorless liquid with a pleasant odor, ethyl trifluoroacetate possesses a very low order of toxicity.

What can this ester be used for? It is used in the preparation of trifluoroacetone. The ester and the acetone undergo a Claisen condensation to form hexafluoroacetylacetone used in the separation of rare earths. It is used as an intermediate for the

introduction of CF_2CO groups and CF_2COH groups into organic compounds by the Claisen, Friedel-Crafts, Grignard and other similar condensation reactions. Many possibly useful monomers can be prepared, starting with ethyl trifluoroacetate.

Dow Chemical Co., Midland, Mich.

FLAME-RESISTANT:

Plasticizer

Carbide & Carbon Chemicals Corp. is making commercially available a flame-resistant plasticizer designed primarily for use with cellulose acetate and mixed cellulose esters. The plasticizer, tri-2-chloroethyl phosphate, marketed by Carbide & Carbon as Flexol 3CF, is also useful as a softener for nitrocellulose, ethyl cellulose, methacrylate resins and synthetic rubber.

When Flexol 3CF is used as the sole plasticizer in cellulose acetate films, concentrations as low as 10 percent are reported to produce self-extinguishing compositions. This plasticizer pours freely below −25 deg. C. and is less volatile than dibutyl phthalate. The solubility of 3CF in mineral oil at 20 deg. C. is less than 0.7 percent by weight, but 3CF is miscible with the common lacquer solvents.

Before the war, tri-2-chloroethyl phosphate was produced in Germany and marketed in the United States as Cetamoll QU. Flexol plasticizer 3CF represents an improvement over the imported product. 3CF is lower in acidity and much more stable to the prolonged heat encountered in commercial molding practice.

Carbide & Carbon Chemicals Corp., 30 East 42nd St., New York 17, N. Y.

FOR COTTON AND RAYON:

Flame Retardant

When properly applied, Du Pont's new flame-resistant chemical for cotton and rayon fabrics gives these fabrics a flame resistance that withstands dry cleaning, normal home laundering and weathering, but which does not change the appearance or hand of the material. Results achieved with Erifon, as it is called, surpass the requirements of the most exacting fabric flame tests of government and industry.

A flame held to treated material will char the fabric at the point of contact, but the flame does not spread. The effect is particularly striking in such highly flammable materials as tufted or napped cellulosic fabrics, which ordinarily burst into flames when ignited. Properly treated with Erifon, they merely char, and then only at the point of contact for as long as the flame is applied.

Tests indicate that the retardant remains effective in fabrics after more dry cleanings and normal home launderings than they would usually receive in their lifetime. But the retardant cannot withstand the acid sours and alkalis used in commercial and industrial laundries.

Erifon does not impair the hand nor does it change the draping qualities of materials. It does not stiffen or weaken them, and at most adds only 15 percent to the weight. Fabrics treated with Erifon do not irritate the skin.

The new retardant is a solution of titanium and antimony salts. It actually reacts with cellulosic molecules and is locked into the structure of the fibers, rather than merely coating the surface. It changes the fibers chemically, but causes no change in physical properties.

There is one gimmick: its application is so tricky and expensive that it can be handled only in textile mills. Some extra equipment is needed in most mills to apply the chemical. So Erifon is unlikely to affect the use of existing temporary type flame retardants for purposes in which durability is not a factor.

The new chemical is a baby of the Pigments Department, which has had plenty of experience with titanium. Erifon is being produced at Du Pont's pigments plant at Newport, Del., on a commercial scale. Facilities are considered adequate to meet any foreseeable demand. Erifon sells for 25c. a lb.

E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del.

INTERMEDIATE:

Heptafluorobutyric Acid

Another fluorinated acid has just been introduced by Minnesota Mining & Manufacturing Co. The new acid—heptafluorobutyric acid, C_3F_7COOH—is a colorless, highly corrosive liquid. It is expected to find wide use in industry as a chemical intermediate.

Properties of the new acid include low surface tension (15.8 dynes per

(Continued)

AEROCOR INSULATES STEAM-TRACED LINE AT REFINERY

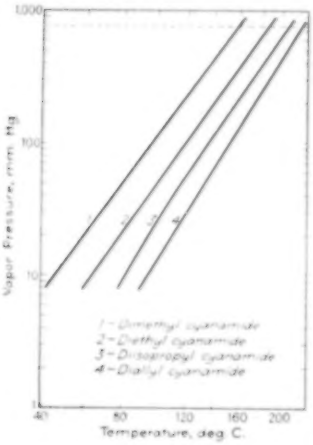
Workmen wrap Aerocor snugly around both a 6-in. carrier pipeline and its ¾-in. steam tracer line at Gulf's Toledo refinery. Aerocor, made by Owens-Corning Fiberglas Corp., is a blanket type, flexible material, with a density of 1½ lb. per cu. ft., composed of extremely fine glass fibers with a thermosetting resin. It provides a fire-safe, inorganic, rotproof insulation with high resistance to heat flow, which can be used up to 600 deg. F. Aerocor costs about as much as other materials used for jobs like this. But its use cuts fabrication and application costs, thus insuring savings.

cm.) and strong acidity. It is non-oxidizing and non-oxidizable, boils at 120 deg. C. and freezes at −17.5 deg. C.

This fluorochemical is the second fluorinated acid announced by Minnesota Mining. The first was trifluoroacetic acid (see *Chem. Eng.*, Oct. 1949, p. 157). And 3M researchers are hard at work on other monobasic acids.

Research-size samples of heptafluorobutyric acid have just been made available for experimental work by other companies. A technical bulletin can also be secured.

Minnesota Mining & Manufacturing Co., 900 Fauquier St., St. Paul 6, Minn.



Diallyl Cyanamide

For the first time diallyl cyanamide is being offered in trial-lot quantities by American Cyanamid Co. This new compound is a liquid that boils at 222 deg. C. and freezes below −70 deg. C. Its solubility in water at 28 deg. C. is less than 1 percent. Diallyl cyanamide is miscible with most organic solvents, and it acts as a solvent for most natural and synthetic resins.

The chemical reactions of diallyl cyanamide are based mainly upon the reactivity of the nitrile group with compounds containing active hydrogen. Reactions of diallyl cyanamide with water, amines, alcohols and hydrogen sulphide merit exploration.

In addition to diallyl cyanamide, the dimethyl, diethyl and diisopropyl cyanamides are also available in experimental quantities. A technical bulletin describing the chemical and physical properties of these compounds can be secured.

American Cyanamid Co., New Product Development Department, 30 Rockefeller Plaza, New York 20, N. Y.

LIGHTER COLOR:

Dioctyl Phthalate

A new dioctyl phthalate that is lighter in color is being produced at the Kingsport, Tenn., plant of Tennessee Eastman Corp. Refinements in manufacturing processes made possible the production of the lighter colored phthalate.

Both plastic and electrical grades are offered having a maximum APHA color rating of 50. It is believed that this is the first time that such outstanding color specifications have been guaranteed. Color ratings of this widely used plasticizer heretofore have been about 100 for the non-electrical grade and 150 for the electrical.

This will be a big boon to manufacturers who use vinyl compounds in preparing lacquers and coatings, and plastic films and sheeting—particularly to those who are after delicate pastel shades or transparency.

Tennessee Eastman Corp., Kingsport, Tenn.

CARBOXYLIC TYPE:

Cation Exchange Resin

Resinous Products Division of Rohm & Haas Co. is now in plant-scale production of Amberlite IRC-50, a carboxylic acid type cation exchange resin that is highly selective. With the full production has come a downward revision of quantity prices.

This exchanger has been proved effective in the recovery of antibiotics. Buffered, it adsorbs selectively such amphoteric substances as amino acids, growth factors and peptides. Also, IRC-50 will absorb cationic fungicides, deodorants, dyes, inks and amine type age-resistors.

The process industries will find widespread application for this versatile resin. Its unique facility for adsorbing certain metallic ions has been demonstrated in the recovery of metals from process wastes and mining operations. It is said also to possess extremely high capacity in alkaline media. This fact, plus its efficiency in regeneration, makes the exchanger particularly adaptable to the new technique of reverse de-ashing of acid-sensitive systems such as sugars and proteins. In this technique, IRC-50 is used together with a strongly basic anion exchanger (such as IRA-400), which converts the metals of neutral salts to the corresponding free bases. In water conditioning, these same properties are being exploited in direct dealkalization. In deionization, Amberlite IRC-50 is being used in series with IR-120, a high-capacity cation exchange resin, to provide greater capacity and more efficient use of regenerant.

Rohm & Haas Co., Resinous Products Division, Washington Square, Philadelphia 5, Pa.

FROM SOYBEAN:

Cortisone Derivatives

Two big breaks in the battle against rheumatoid arthritis are announced by the Glidden Co. One is the synthesis from abundant soybean of new hormone compounds closely related to Cortisone. The other is a new and less costly method of synthesizing the still rare and expensive Cortisone. (It would take 14,600 cattle to provide enough Cortisone to relieve one arthritis patient for one year.)

Glidden's Dr. Percy L. Julian

Both developments are the work of the research staff of Glidden's Soya Products Division. Directing the researchers is the brilliant Dr. Percy L. Julian.

Most promising of the compounds created from soybean sterols is 17-alpha-hydroxy-desoxycorticosterone, also known as Reichstein's Compound S, which differs from the Cortisone molecule by only one oxygen atom. It is now to be tested in the treatment of rheumatoid arthritis. Other compounds synthesized: 17-alpha-hydroxy-progesterone and two space isomers of pregnenetriolone.

Glidden's method of making Corti-

(Continued)

The extremely reactive maleates open new fields for investigation in the manufacture of

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SURFACE-ACTIVE AGENTS

DIMETHYL
DIETHYL
DIBUTYL
Maleate

Water-white liquids, miscible with most organic solvents, the three maleates incorporate ester groups which offer real advantages over maleic anhydrides in many applications. Liquids at ordinary temperatures, they can easily be handled in a closed system. Our Technical Service Division is on call to help you apply these useful compounds to your products or processes. For free samples and further information, write, wire, or phone today!

PROPERTIES:

	DIMETHYL MALEATE	DIETHYL MALEATE	DIBUTYL MALEATE
Formula:	$(-CHCO_2CH_3)_2$	$(-CHCO_2C_2H_5)_2$	$(-CHCO_2C_4H_9)_2$
Molecular weight (calc):	144.12	172.18	228.28
Density, g/ml, at 25°C:	1.1462	1.0637	0.9907
Weight per U. S. gal. at 25°C:	9.56	8.88	8.27
Coefficient of Expansion, 20°C to 30°C, per 1°C:	0.00089	0.00094	0.00088
per 1°F:	0.00049	0.00052	0.00049
Refractive Index, n_D at 25°C:	1.4405	1.4383	1.4435
Boiling Point, °C at 760 mm of mercury:	200.4	225.3	d
220 mm of mercury:	157.0	177.7	224.9
10 mm of mercury:	84.0	99.4	138.7
Heat of Vaporization, kcal/mole:	12.2	12.5	....
Melting Point, °C:	−17.5	−11.5 (approx.)	....
Viscosity, centipoises; at 25°C:	3.21	3.14	4.76
Flash Point, Cleveland Open Cup:	235°F	250°F	285°F
Surface Tension, dynes/cm, at 25°C:	41.2	36.7	28.7
Solubility, Ml H_2O in 100 ml product:	5.0	2.1	<0.05
Ml product in 100 ml H_2O:	7.0	1.3	<0.05

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METAL PRODUCTS CORP.
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Weehawken, N. J.

some bypasses the use of osmium tetroxide, the rare and expensive chemical previously essential in building the complex Cortisone molecule. More important, the new method makes possible the synthesis of compounds related to Cortisone that promise to have more prolonged activity in the human system than Cortisone itself.

Makers of pharmaceuticals cooperated with Glidden by supplying intermediate materials to speed the successful production of the new Compound S and other companions of Cortisone. Glidden will distribute the entire supply of the new compounds to pharmaceutical manufacturers and clinicians, including those at the U. S. Public Health Institute, so that their possibilities may be determined. The company emphasizes that it is unable to supply Cortisone to anyone for treatment purposes at this time.

Glidden Co., Soya Products Division, 5165 West Moffat St., Chicago 39, Ill.

REDUCING AGENT:

Aluminum Isopropoxide

Makers of pharmaceuticals, flavors and perfumes can now get aluminum isopropoxide with a minimum purity of 99 percent from Tennessee Eastman Corp. Commercial quantities are immediately available.

The chemical is specific in its reaction with carbonyl groups of aldehydes and ketones. This important reducing agent, because of its mild action, is useful in the selective reduction of hormones, vitamins, alkaloids and other complex organic molecules.

Tennessee Eastman Corp., Kingsport, Tenn.

FINE PARTICLE:

Silica Pigment

An extremely fine-particle hydrated silica pigment is now being produced in volume at a comparatively low price by Columbia Chemical. Particle size is 0.025 micron, measured by the electron microscope.

The manufacturer claims that this is the first practical silica pigment in its field. Hi-Sil, as it is called, is a very absorptive pigment. Its specific gravity is 1.95. The pH of the pigment can be varied over a wide range, from about 2.5 to about 9.5. Hi-Sil is said to impart high tensile strength, good abrasion resistance and exceptional tear resistance to natural and synthetic rubber compounds. For use in vinyl resin compounds it imparts unique properties that are wanted for many applications.

Compounders of natural and synthetic rubbers and of vinyl resins can get the new pigment immediately.

Pittsburgh Plate Glass Co., Columbia Chemical Division, 632 Duquesne Way, Pittsburgh, Pa.

Hat with Tough Crown Gives Added Protection

A new resin-impregnated Fiberglas crown, said to be the strongest and most resilient ever built for a safety hat, has been developed by the E. D. Bullard Co. for its line of Hard Boiled Hats. Impervious to moisture and acids and passing all dielectric tests, the crown is non-shattering and will not deteriorate with age.

The hat can be produced in almost any color wanted. Moreover, since the pigment is impregnated in the material, the colors are permanent. There is also a pigmented hat that glows in the dark for tunnel or mine workers and night construction crews.

The manufacturer believes that the new crown's superior resistance to radiant heat will lower incidence of sun and heat stroke among workers.

E. D. Bullard Co., 275 Eighth St., San Francisco 3, Calif.

PROMISING PAIR:

Alanine Derivatives

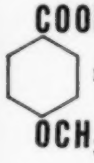
Experimental quantities of two new alanine derivatives can be secured from B. F. Goodrich Chemical Co. One is *n*-hydroxyethyl-beta-alanine, a promising intermediate. The other is *n*-dodecyl-beta-alanine, which forms films that are surface-active.

The *n*-hydroxyethyl-beta-alanine is distinguished by three chemically active groups, hydroxyl, amino and car-

(Continued)

NEW HEYDEN CHEMICAL "BUILDING MATERIALS"

ANISIC ACID



Mol. Wt. 152.14

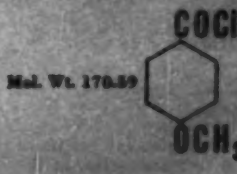
Availability: Commercial quantities

Containers: 100 lb. fiber drums

PROPERTIES

Appearance	Light tan powder
Melting Range	180°C.—183°C.
Assay	99.5%
Solubility	Insol. in water, sol. in alcohol, etc.

ANISOYL CHLORIDE



Mol. Wt. 170.59

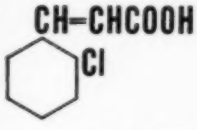
Availability: Commercial quantities

Containers: 500 lb. stainless steel drums

PROPERTIES

Appearance	Clear colorless liquid
Freezing Point	22°C.
Boiling Point	265°C. Sl. dec.
Sp. Gr. 25°/25°C.	1.258

ORTHO-CHLOROCINNAMIC ACID



Mol. Wt. 182.60

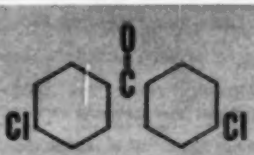
Availability: Pilot plant quantities

Containers: 100 lb. fiber drums

PROPERTIES

Appearance	Light tan powder
Melting Range	207°—213°C.
Assay	98.5%
Solubility	Insol. in water and alcohol, sl. sol. in ketones

4,4-DICHLOROBENZOPHENONE



Mol. Wt. 251.11

Availability: Pilot plant quantities

Containers: 100 lb. fiber drums

PROPERTIES

Appearance	Ivory powder
Congealing Point	145°C.
Assay	99.0%

Technical literature and samples sent promptly upon request on company letterhead

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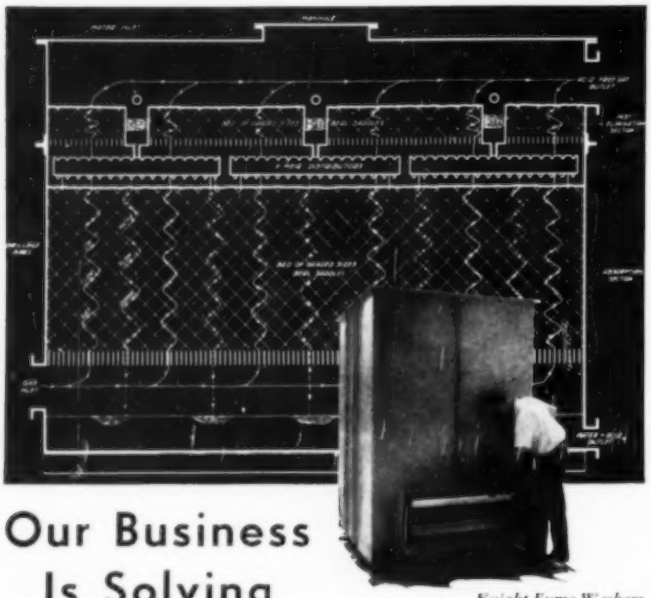
Disalicylic Acid • Paraformaldehyde • Parahydroxybenzoates
Penicillin • Pentaerythritols • Propyl Gallate
Quadrafos • Salicylates • Salicylic Acid • Streptomycin



Our Business Is Solving

Knight Fume Washers Eliminate Corrosive Fumes

CORROSION PROBLEMS

Thru the years Knight engineers have solved a great variety of corrosion problems. With this wide experience they have designed many types of acid- and alkali-handling equipment to meet the conditions of individual customers' problems. Besides our own, they use many other types of materials to develop successful functional units.

Some of the Knight products they use are: *Knight-Ware,* an acid- and alkali-proof chemical stoneware; *Permanite,* a new resin material that is used alone or reinforced with glass fabric; and *Pyroflex,* a thermoplastic resin. Depending on the needs of the job, Pyroflex construction often includes steel, Pyroflex, Knight-Ware, Permanite, rubber, lead, glass, carbon and plastics. Thus a complete functional unit is designed by combining the best materials for a specific job.

Knight Chemical Equipment for handling corrosive chemicals is being used in just about every process industry. That is why those faced with special corrosion problems first submit them to—

MAURICE A. KNIGHT
111 Kelly Ave., Akron 9, Ohio

Visit Exhibit No. 53, Exposition of Chemical Industries, New York

KNIGHT-WARE
CHEMICAL EQUIPMENT

boxyl, which makes the material particularly useful as a chemical intermediate for organic synthesis. It is furnished as a light buff-colored crystalline solid, is miscible with water, soluble in acids and in alkalis, slightly soluble in alcohol, and insoluble in benzene and chlorinated hydrocarbons. It has a molecular weight of 133, and its melting point is 143-145 deg. C.

The *n*-dodecyl-beta-alanine may be of special interest as an emulsifier, wetting agent and detergent in the pharmaceutical, soap and cosmetic industries. This is reactive with both inorganic acids and bases furnishing corresponding salts that notably decrease the surface tension of water. Furnished as a white, crystalline solid, it has a molecular weight of 275 and melting point of 55-60 deg. C. It is insoluble in water and is soluble in sodium hydroxide solutions, alcohols, chlorinated hydrocarbons and benzene.

B. F. Goodrich Chemical Co., 324 Rose Bldg., Cleveland 15, Ohio.

FOR REPRODUCTION PAPERS:

Diazo Line

Edwal Laboratories, Inc., active in research and technical service in the diazo field, has further expanded its line of products for coaters of reproduction papers.

Edwal's new Coupler 111, together with diazo compounds 9 and 10, forms a water-fast blue line direct positive reproduction. Compound 9 is para-diazo diethylaniline zinc chloride; compound 10 is para-diazo ethyl hydroxyethylaniline. These new items further expand the Edwal reproduction chemical line.

Coaters of reproduction papers are finding these new products extremely helpful in their development work.

Edwal Laboratories, Inc., 732 Federal St., Chicago 5, Ill.

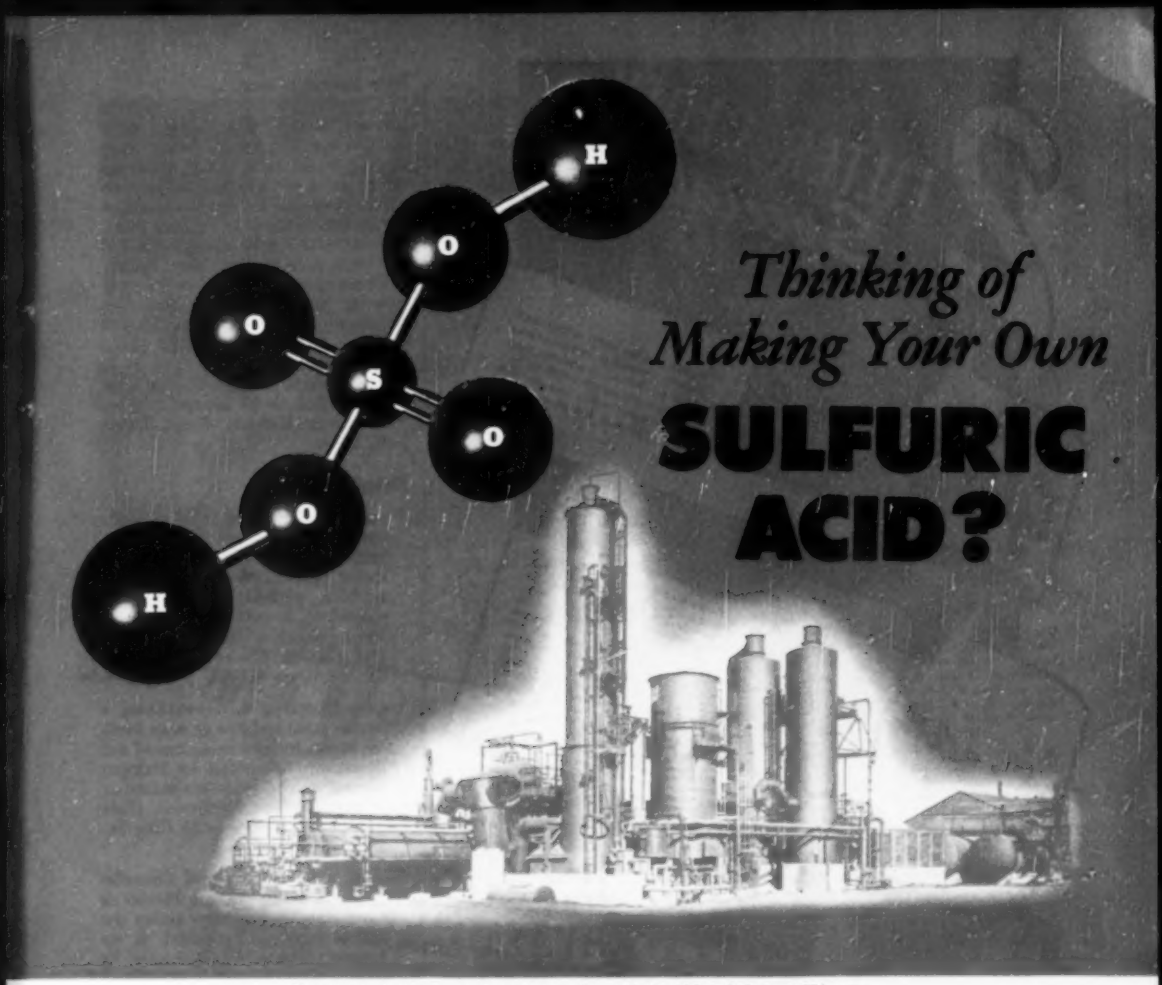
FOR SHADING:

Direct Acetate Brown

Newcomer to the line of Tennessee Eastman Corp.'s acetate dyestuffs is Eastone Brown 2R, a straight, direct acetate brown. The designation Eastone identifies this dye as belonging to Eastman's series of dyestuffs which are dischargeable, as well as usable for plain dyeing. The new direct acetate brown dyes acetate fibers a reddish brown and nylon a slightly duller shade.

Unique shade and fastness properties attributed to Eastone Brown 2R

(Continued)



This Chemico-built plant was designed to produce sulfuric acid from hydrogen sulfide gas.

Many users find it economical to buy sulfuric acid in drums or in tank cars. Others—who need larger quantities—produce their own more profitably. If you have been contemplating the expansion of your present facilities or the erection of a new plant for the manufacture of sulfuric acid, consider these facts about Chemico-built contact acid plants.

TROUBLE FREE OPERATION—You get maximum production of acid the year round because of Chemico's *exclusive* Spray Type Sulfur Burning Equipment.

ECONOMICAL HEAT RECOVERY—Heat resulting from the combustion of sulfur and from the conversion of SO_2 to SO_3 is recovered in waste heat boilers and economizers as valuable by-product steam. This makes possible greater economy of operation, elimination of the need for a separate supply of steam and cools the gases to suitable operating temperatures.

HIGH CONVERSION—The high production rate and low operating costs of Chemico plants are largely due to the well-designed converters and the use of the highly effective, non-poisonable Vanadium Catalyst.

These cost-reducing design features are only a few of the outstanding benefits of Chemico-built sulfuric acid plants. They may point the way to vital savings in fulfilling your acid needs. But before deciding whether it would be sound business to produce your own sulfuric acid, discuss your specific problems with Chemico.

AN INTERESTING BULLETIN S-101—gives you additional information on Chemico Sulfuric Acid Plants. Write for your copy today.

CHEMICAL CONSTRUCTION CORPORATION

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are said to make it a valuable color for shading and for producing deep tertiary shades on a variety of fabrics which must meet certain fastness requirements. It is highly recommended by the manufacturer as the base color, in conjunction with the gas-resistant azo blues, in formulating lining shades.

Commercial quantities of the new dyestuff are immediately available. Shipments of Eastone Brown 2R will be made from the company's plants in Kingsport, Tenn., and Lodi, N. J., and in Canada through Clough Dyestuff Co., Ltd., in St. Laurent, Quebec.

Tennessee Eastman Corp., Kingsport, Tenn.

Briefs . . .

Versatile intermediate is Monsanto's new high molecular-weight alcohol, tentatively called AE-1. It has widespread potentialities as an additive, modifier, pigment dispersant and plasticizer. It can be used in oils, resins, protective coatings, adhesives and plastics. *Monsanto Chemical Co., St. Louis 4, Mo.*

Organic fluorides, each containing a double bond and one or more fluorine atoms, are now being turned out in research quantities by Halogen Chemicals, Inc., for evaluation as fluoroplastic intermediates. *Halogen Chemicals, Inc., 616 King St., Columbia 52, S. C.*

Casting composition, called Calcerite-A, developed by Furane Plastics & Chemicals Co., employs amino resins as binders. Furnished as an opaque white powder, it can also be colored by dyes and pigments. Its greatest field of use will probably be in hard, durable tools and patterns for the machine shop, foundry and material fabrication processes. It has outstanding dimensional stability, important in precision tooling. *Furane Plastics & Chemicals Co., 719 West Broadway, Glendale 4, Calif.*

Synthetic pyrethrum, so-called, based on the La Forge synthesis disclosed by the Department of Agriculture, can now be had from U. S. Industrial Chemicals. The chemical, an allyl homolog of Cinerin I, practically duplicates one of the active principles of pyrethrum, of which USI is the major producer. Supplementing present limited supplies of natural pyrethrum, the new chemical may spark expanded use of pyrethrum-type insecticides. *U. S. Industrial Chemicals, Inc., 60 East 42nd St., New York 17, N. Y.*

—End

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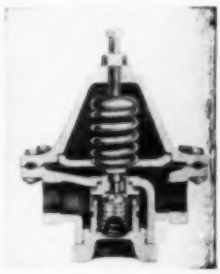
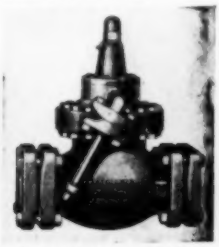
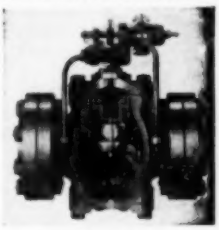


Bulletin 950—features the CASH STANDARD Type D Single Seat Pressure Reducing and Regulating Valves for use with most fluids. Shows simple inner working parts that save in maintenance. Diagram explains how valve works. Blueprint shows simplicity of installation



Bulletin 956—features the CASH STANDARD Type 4030 Back Pressure Valve — designed to automatically maintain a constant pressure in the evaporator corresponding to a constant temperature desired. Shows an Ammonia and Freon Gas Capacity Chart based on ABSOLUTE pressures.



Bulletin 966—features the CASH STANDARD Self-Contained, Pilot Operated Type 10 Pressure Reducing and Regulating Valve for use with water or air; with any gas or oil that is non-corrosive; and with refrigerating fluids such as Ammonia and Freon. Many interesting particulars explained such as: how valve works, tight seating, large capacity, no waste, no water hammer or chatter.

A CHEMICAL ENGINEERING PICTURED FLOWSHEET

Ozone equipment building at the Belmont Water Filtration Plant in West Philadelphia. At this plant ozone is produced for purifying river water.

Ozone

The world's largest ozone plant for water purification was recently put in operation at the Belmont Filtration Works of the City of Philadelphia. The primary purpose of the ozone treatment is the oxidation of impurities in Schuylkill River water which cause obnoxious tastes and odors.

The plant is of special interest to chemical engineers since it represents a large scale application for a chemical often looked upon as a laboratory curiosity.

The generation process is relatively simple; air (or oxygen) is passed through an electric discharge and a portion of the oxygen is converted into ozone. Werner Siemens produced ozone in essentially the same way almost one hundred years ago. However, the advances in chemical engineering and metallurgy during the past few years have made large scale production of ozone practical.

The rated capacity of the Belmont plant is 1250 lb. of ozone a day but the design is flexible enough to allow efficient operation at a load factor of 20 percent or even less. This flexibility is necessary because of variations in water flow and quality which cause wide variations in the ozone demand. In accordance with waterworks design practice critical components have been set up in duplicate to provide standby units throughout.

Air is drawn from outdoors through a combination electrostatic precipitator-paper filter by one or more positive displacement rotary blowers. The air is compressed to about 10 psig.

From the blowers the air passes to one of two cooling units where it is reduced to a temperature of 40-50 deg. F., condensing out most of the moisture. Each cooler consists of four coils in series, two water coils and two Freon coils. A maximum of 2,000 cfm. (free) air at 230 deg. F. and 77 deg. F. dew point can be cooled by either cooling unit to 50 deg. F. or less. The water coils reduce the air temperature to 90 deg. F. or less depending on cooling water temperature. The Freon coils then bring it down to 50 deg. F. or less.

Cooled air is then passed to one of two dehydrating units which dry it to a dryness corresponding to a dewpoint of minus 60 deg. F. or less. (Higher moisture content decreases ozone production and increases the aggressiveness of ozonized air). The dehydrators remove moisture by adsorption on desiccant grade activated alumina. The desiccant is reactivated by an electrically heated hot air blast.

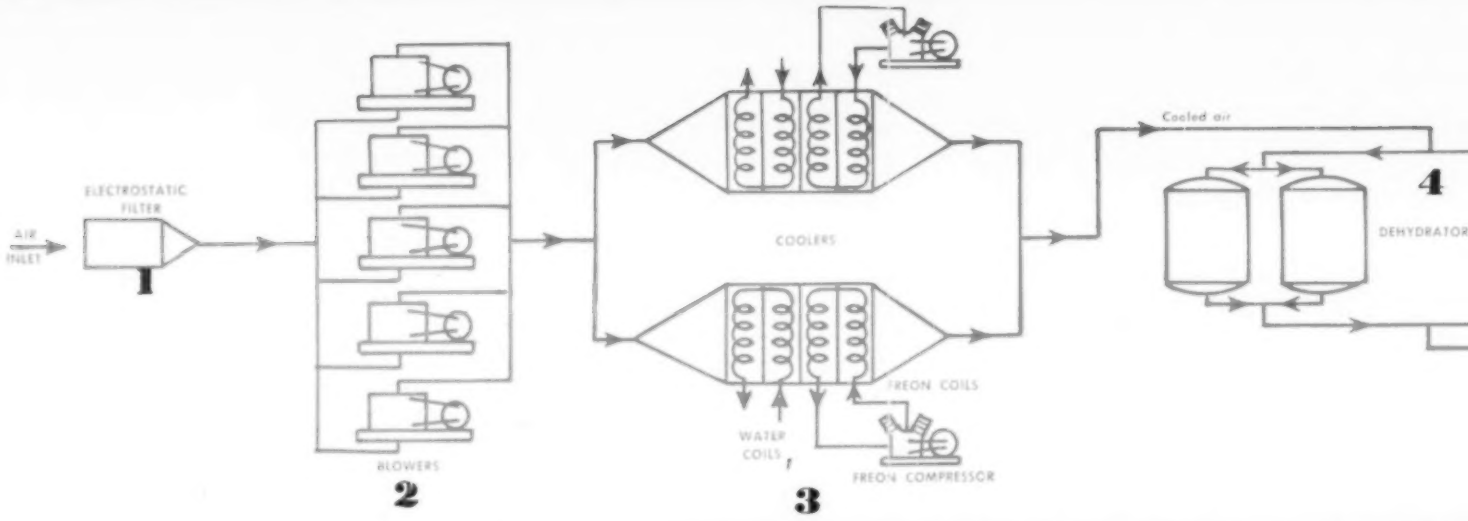
The air leaving the dryers passes to the two banks of ozone generators (50 in all). The ozonators (ozone generators) are electrical discharge machines which subject air to the action of the silent electric discharge. The discharge converts about one percent (by weight) of the oxygen in the air to ozone.

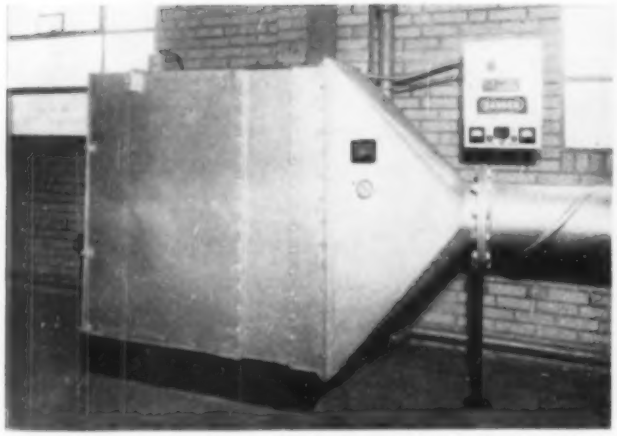
The ozonized air is piped to the ozone-water mixing units where it is forced through porous alundum plates and dispersed into the water in the form of fine bubbles. The porous plates cover the entire bottom of the mixing tanks and are 18.5 ft. from the water line.

The mixing tanks are designed for a flow of 36,000,000 gpd. of presettled water. After ozonation the water passes to a coagulation and rapid sand filter plant. Ozone oxidizes both organic impurities and soluble iron and manganese salts in the water. The impurities which cause the tastes and odors are due to a variety of industrial wastes, domestic sewage, and natural organisms.

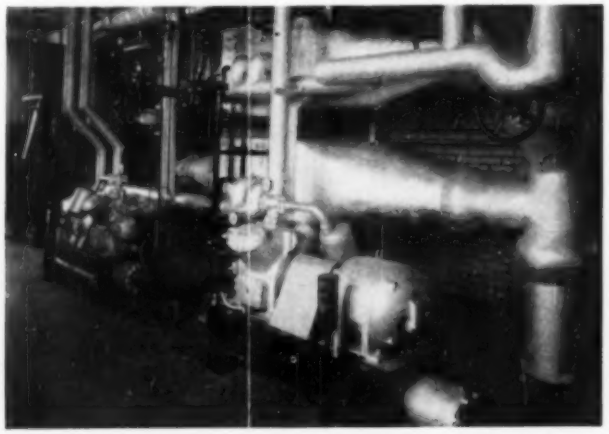
The same ozonators produce twice the quantity (and concentration) of ozone from oxygen as from air.

CHEMICAL ENGINEERING • NOVEMBER 1949 • PAGES 168-171





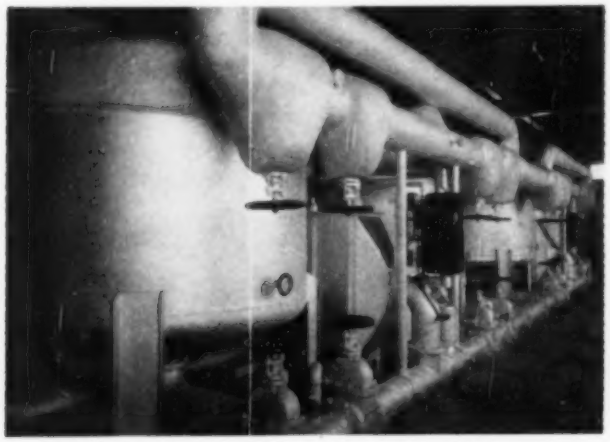
1 Air is drawn through a combination electrostatic-paper filter to remove dust and dirt before being subjected to the electrical discharge.



3 Coolers and refrigeration compressors where the air is cooled to 50 deg. F. or less to condense the greater part of the moisture.

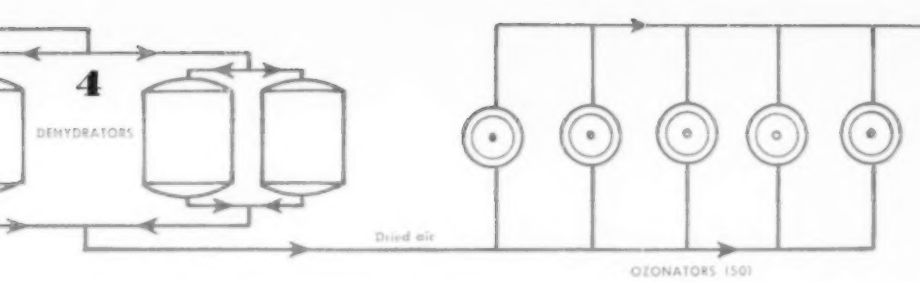
5 Ozone generators wh
electric discharge. S

2 Group of blowers which force air through conditioning equipment, ozonators, porous media, and eighteen feet of water in the mixing tanks.



4 Dehydrators where the remaining moisture is removed by absorption on desiccant grade activated alumina. The alumina is re-activated.

6 Ozone-water mixing
the objectionable ta



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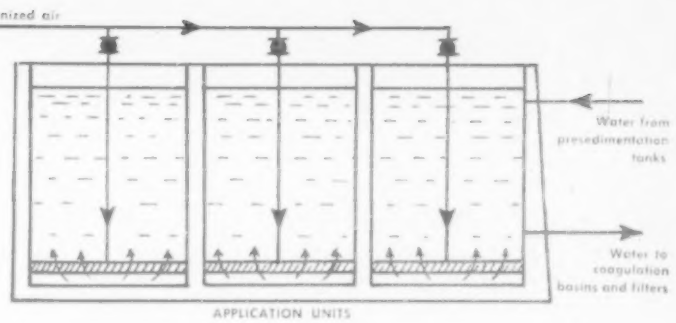
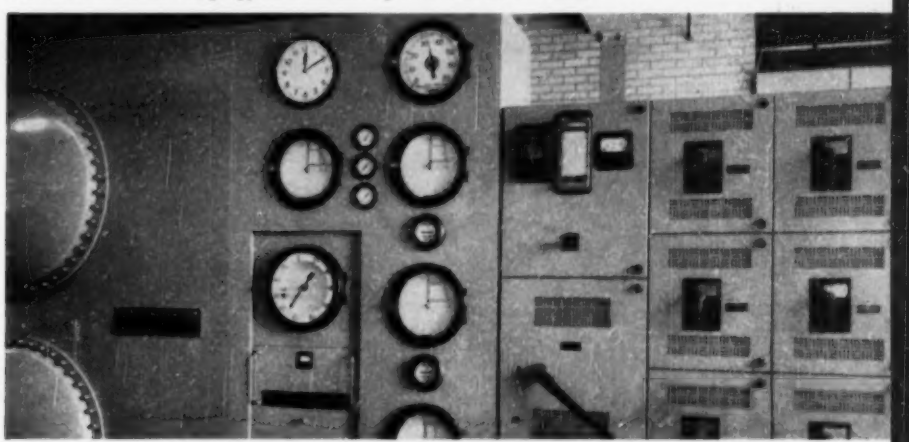


6

one generators where a small fraction of the oxygen in the incoming air is converted to ozone by the action of an tric discharge. Straight oxygen may also be fed to these generators with a higher yield.

Shown here are several banks of individual ozonator transformers. These transformers raise the voltage up to 15,000 v., which is the voltage applied to the ozone generators for the conversion.

ne-water mixing tanks where ozonized air is dispersed in the form of fire bubbles. The impurities which cause objectionable tastes and odors as well as soluble iron and magnesium salts are oxidized here.



A view of the control and instrument panels. The instrument at the lower left records the dew point temperature of the dried air, which is kept between —60 deg. F. and —100 deg. F.

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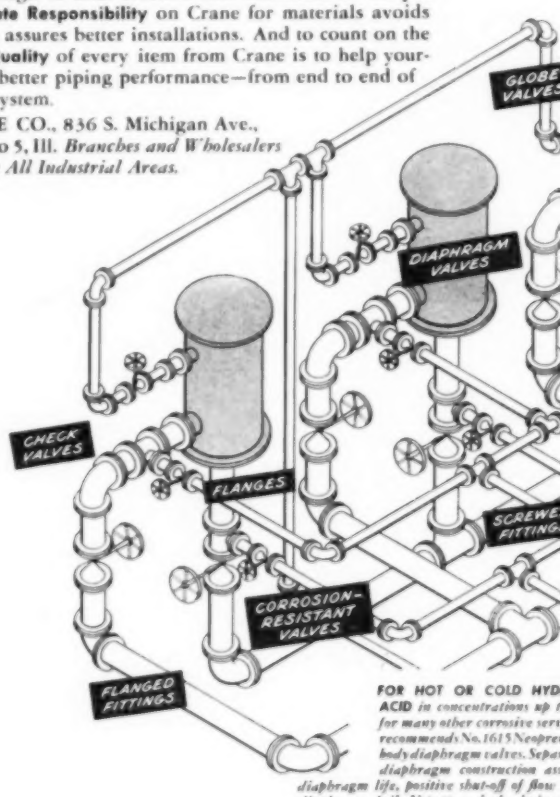

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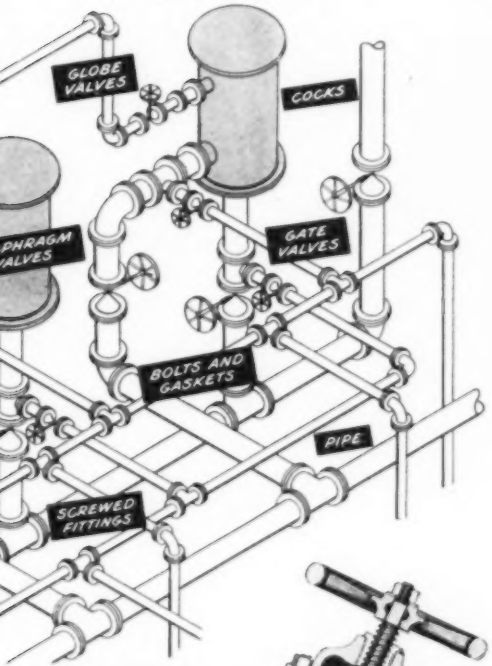

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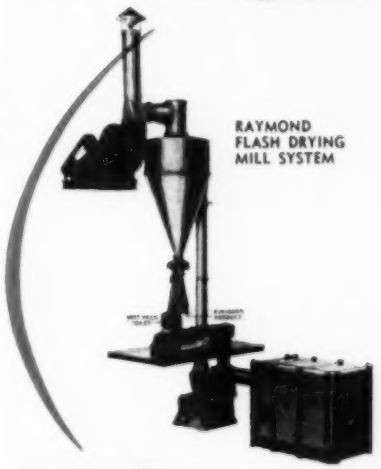

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Chemical Engineering News

JOSEPH A. O'CONNOR, *News Editor*

Dewey and Killian Speakers At Celanese Award Dinner

More than 1,000 guests will witness the presentation of this year's Award for Chemical Engineering Achievement to the Celanese Corp. of America at a subscription dinner on Thursday evening, December 1, at the Waldorf-Astoria Hotel in New York.

Alfred H. White, chairman of the Award Committee and professor-emeritus of chemical engineering at the University of Michigan, Ann Arbor, will make the presentation of the award. Harold Blancke, president of the Celanese Corp. of America, will accept the award. This will be the tenth time that the award, sponsored by *Chemical Engineering*, has been bestowed upon an organization or group of organizations for an outstanding achievement.

"Integration for National Security" will be discussed by Col. Bradley Dewey, president of Dewey & Almy Chemical Co. and wartime rubber director of the United States, in the first of two major addresses at the award dinner. Col. Dewey will explain what corporate size and structure mean to U. S. defense.

In the second address, "Integration and Education," James R. Killian, Jr., president of Massachusetts Institute of Technology, will tell why technical men should be trained to enter all phases and functions of modern industry.

Acting as toastmaster will be Sidney D. Kirkpatrick, editor of *Chemical Engineering* and vice president of the McGraw-Hill Book Co.

The number of guests permitting, present plans are for the award dinner to be held in the Waldorf's Starlight Roof. Otherwise it will be shifted to an even larger room.

Celanese got the award for its postwar advances in the chemical, plastics and textile fields, all achieved through the teamwork of its chemical engineers. Underlying these advances was the pioneering work of Celanese in the direct oxidation of petroleum hydrocarbons. During 1949 the development program led to the production of flake formaldehyde. In addition, production of *n*-butanol and isobutanol has been initiated, and volume production of propylene glycol is getting under way. Celanese is also opening up a new source of cellulosic raw materials up in Canada in the province of British Columbia.

BIGGEST CAT CRACKER IN THE WORLD

Designed to produce almost 1 million gallons of gasoline and 250,000 gal. of heating oil daily, this fluid catalytic cracking unit, largest in the world, was dedicated October 17 at Esso Standard Oil Co.'s Bayway refinery in Linden, N. J. At designed capacity, the new unit will process 41,000 bbl. of crude oil a day. In the left foreground is a fractionating tower that receives product from the cracking section and separates it into gasoline, heating and heavy fuel oils. Towers in the left background are the light-ends facilities that further refine light products after cracking.

Chemical Show to Feature New Processing Equipment

Wraps will be taken off new processing equipment when the 22nd Exposition of Chemical Industries opens in Grand Central Palace, New York, at the end of this month. The show will run from November 28 to December 3.

This year's exposition, occupying all four floors of Grand Central Palace, will be one of the greatest of its kind, both in number of exhibits and in variety of products exhibited. On display will be raw and partially manufactured materials, processing machinery and equipment for manufacturing plants. Exhibits will cover all stages of chemical manufacturing, from the laboratory, through the pilot plant, to actual production, finishing and packing of the ultimate product. Apparatus and instruments used in research and in process control will be on display.

The field of the exposition comprises the production of chemicals, the entire range of chemical processing and the use of chemical ingredients and chemical steps in connection with mechanical operations of all kinds, affecting all industries.

Chairman of the advisory committee of the exposition is E. R. Weidlein, director, Mellon Institute. The committee includes: Roger Adams, head, Chemistry Department, University of Illinois; Raymond F. Bacon, consulting chemist; F. E. Barrows, president, Chemists' Club; Hugh Craig, editor, *Oil Paint & Drug Reporter*; Francis J. Curtis, president, American Institute of Chemical Engineers; J. V. N. Dorr, chairman of the board, Dorr Co.; Alfred L. Ferguson, president, Electrochemical Society; Sidney D. Kirkpatrick, editor, *Chemical Engineering*; Alfred T. Loeffler, president, Salesmen's Association of American Chemical Industry; Walter

(*Continued*)

J. Murphy, editor, *Industrial & Engineering Chemistry*; Linus Pauling, president, American Chemical Society; W. T. Read, General Staff, War Department; N. A. Shepard, chemical director, American Cyanamid Co.; Robert L. Taylor, editor, *Chemical Industries*; and R. Gordon Walker, vice president, Oliver United Filters, Inc.

The exposition opens Monday, November 28, at 2 p. m. It will be open daily thereafter from 11 a.m. to 10 p.m. with the exception of Wednesday and Saturday, when it will close at 6 p.m. The show closes Saturday, December 3, at 6 p.m.

The exposition is under the management of the International Exposition Co. Charles F. Roth is manager and E. K. Stevens associate manager.

Joint Meeting of CCDA and CMRA Held in Philadelphia

A new departure in program arrangement featured the joint meeting of the Commercial Chemical Development Association and the Chemical Market Research Association that was held at the Benjamin Franklin Hotel in Philadelphia on October 19.

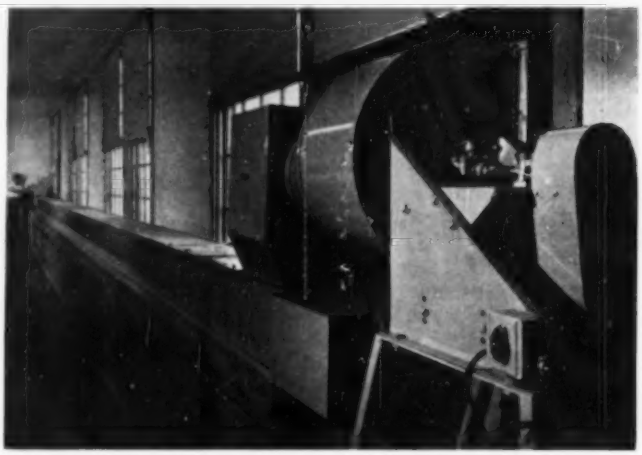
In the first joint session of these two organizations to be held in three years, the afternoon schedule was highlighted by a series of five informal panel discussions on topics of current interest to the chemical industry. Groups of half a dozen industry authorities on these subjects led the informal panel discussions, and comments from the floor followed the introductory remarks of the experts. Topics discussed were: sampling as a part of new product introduction; how market research guides top management in diversification; how market research assists in developing markets for new products; finding new markets for old chemicals with market research; and pricing of new chemicals in the introductory stage.

Dr. C. E. Rassweiler, vice president of research and development at the Johns-Manville Corp., was the after-dinner speaker at the meeting. He discussed "Market Studies as a Guide for Research."

A local program committee, headed by A. B. Hersberger of the Atlantic Refining Co. and G. T. Collins of the Pennsylvania Salt Manufacturing Co., was responsible for the organization of the joint meeting.

Speakers at the morning session discussed ways in which outside agencies can assist in market research and development. Men from five independent market research and management counselling organizations spoke. Donald R. G. Cowan of R. G. Cowan & Associates outlined methods of measuring sales performance in the chemical field, and contrasted the cost and effectiveness of sales programs among different groups of consumers. Other speakers on the morning program included A. B. Dougall of Stewart Dougall & Associates, R. B. Schneider of Arthur D. Little, Inc., Dr. Schreier of A. J. Wood & Co. and H. Idleman of Dun & Bradstreet.

John F. Bunn, Jr., partner in Bioren & Co., who was introduced at luncheon by Dr. Hersberger, considered the chemical industry outlook from an investment counsel's point of view.



NEW WEAPON IN WEST COAST'S ALL-OUT WAR ON SMOG

To find out how impurities in polluted air affect visibility, scientists at Stanford Research Institute rigged up this transmissometer. It consists of contaminant generating and mixing apparatus, an air chamber, a light source, reflecting mirrors to lengthen the path of the light beam in the 40-ft. chamber to over 800 ft., and a photoelectric analyzer. The transmissometer measures the decrease in intensity of a light beam traveling a long path through air polluted with low concentrations of such impurities as SO_2—a compound present in Los Angeles smog. Blower-exhaust section is at right.

Powwows and Plant Trips For AIChE at Pittsburgh

Presentation of technical papers and guided tours through plants in the area will be the features of the 1949 annual meeting of the American Institute of Chemical Engineers at Pittsburgh, Pa., December 4-7.

Technical papers will be presented at morning and afternoon sessions during the four-day meeting. Special symposia and panel discussions will be held concurrently. A committee headed by Dr. James Coull, University of Pittsburgh, had charge of the program.

Recent work in the fields of heat transfer, fluid flow and mass transfer, distillation and absorption will be described. Thermal data will be presented for gases at high pressures, heat transfer media, fluidized systems and fixed porous beds; correlations of heat transfer coefficients will be established for various finned tubes. Velocity distribution and turbulent mixing in isothermal free jets will be described; fluid-solid systems will also be discussed in relation to their kinetics and mass transfer characteristics. Physical separation problems will come in for attention, with reports on washing of liquids from conduits and porous media, elutriation of fines from fluidized systems, and separation of gases by fractional permeation through membranes. The diffusion effects in catalytic oxidation of SO_2 will be described. In the fields of distillation and absorption, characteristics of industrial fractionating tower packing, design calculations in batch distillation, and operation of packed columns will be discussed. Other topics include thermodynamic calculations on compressor and expander design, spray drying of Santomerse resins, and ultrasonics—a new chemical engineering tool.

Twelve guided trips to industrial

(*Continued*)

New technical bulletin, DISTILLATION ENGINEERING AND EQUIPMENT, is available on request.

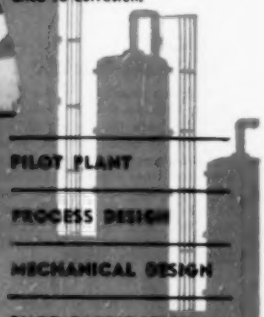
Distillation column of type 316 stainless steel measuring 56 feet in height, 10½ feet in diameter, having six shell sections.

distillation

processes and equipment for . . .

. . . the separation of hydrocarbons or other organic chemicals, should be designed for efficiency in terms of overall operating costs and amortization of capital investment. Tray efficiency, cleaning facility and resistance to corrosion are the principal factors to be considered. For practical purposes, tray efficiency or tray spacing may be reduced to keep tower cost at a minimum. A balance of utility costs against chemical recovery may indicate the desirability of sacrificing some of the recoverable material, with a corresponding reduction in the capital outlay for columns and associated calandrias, condensers and heat exchangers.

Particularly when potential changes in process or product specifications are foreseen, distillation columns with sectional shells and removable trays of light alloy construction offer special opportunities for economy because of the ease of transfer from tower to tower as well as cleanability and resistance to corrosion.



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Vulcan distillation evaporation extraction processes and equipment

THE VULCAN COPPER & SUPPLY CO. — General Offices and Plant, CINCINNATI, OHIO
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LOOK WHAT'S HAPPENING

on the Texas Coast

$10 MILLION IN STEEL MILLS IN 10 DAYS

That's what Houston got in September. A. O. Smith and Sheffield Steel first announced start of a $5 million plant to produce 360,000 tons or more of steel pipe a year. A few days later U. S. Steel subsidiary, Consolidated Western Steel Corporation, announced construction of its $5 million plant on a 78-acre site near the Ship Channel. New plants are needed to supply the Gulf Coast's constantly growing oil, gas and chemical needs.

☆ ☆ ☆

NEW WAX WORKS FOR HOUSTON

Shell Oil Company recently completed a new plant where 75 million pounds of high-purity wax will be produced each year. Raw material will be crude wax, by-product of manufacture of lubricating oils. Finished products will be used in making milk cartons, bread wrappers, candles, cosmetics and other products.

☆ ☆ ☆

TALL TALE, BUT TRUE

Non-inflammable gas—known as helium—which is used in balloons is produced at Amarillo. An Easterner, visiting in Houston, mentioned that his tour would include Amarillo.

"You want to be sure to see the helium plant there—it's the only one in the world," someone said.

"Thanks for telling me about that plant; I surely hope it's in bloom while I'm there," the Easterner replied.

☆ ☆ ☆

CHEMICALS ARE TEXAS-MINDED

. . . and no wonder—for the Texas Gulf Coast offers the chemical industry everything it needs for successful, profitable operation — good weather, good transportation, ample labor supply, available sites and most important, unlimited supplies of acids, bases, fresh water and cheap natural gas for fuels and hydrocarbons. These are good reasons why your industry can profitably FOLLOW THE TREND TO TEXAS.

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To help you find out more about the area we serve, we will gladly: (a) make a survey engineered to your company's needs; (b) supply you with any special information you require; (c) show you the coast country from Sabine to Rio Grande rivers — all in strictest confidence. Write, wire or telephone the Houston Pipe Line Company, Houston, Texas.

HOUSTON PIPE LINE CO.

Subsidiary of Houston Oil Company of Texas

Wholesalers of **Natural GAS**

NEWS, *cont. . .*

plants and research laboratories in the Pittsburgh area have been planned. These trips will seek to dramatize the significance and magnitude of the contribution to the national economy made by Pittsburgh, "the workshop of the world." Companies that will open their doors to visiting members of AIChE include: Aluminum Co. of America, New Kensington, Pa.; U. S. Bureau of Mines, Bruceton Experimental Station, Bruceton, Pa.; Carnegie-Illinois Steel Corp., Clairton, Pa.; Climax Molybdenum Co., Langeloth, Pa.; Elliott Co., Jeannette, Pa.; Gulf Research & Development Co., Pittsburgh, Pa.; Jones & Laughlin Steel Corp., Aliquippa Works, Aliquippa, Pa.; Koppers Co., Inc., Kobuta Plant, Kobuta, Pa.; Mellon Institute, Pittsburgh, Pa.; Pittsburgh Consolidation Coal Co., Disco Plant, Imperial, Pa.; St. Joseph Lead Co., Josephtown, Pa.; Westinghouse Electric & Manufacturing Co., East Pittsburgh Plant, Pittsburgh, Pa.

All trips will be conducted on Monday and Tuesday, December 5-6, of the meeting, each trip being limited in size to 40 people, for better handling and close contact.

CONVENTION CALENDAR

American Society of Mechanical Engineers, annual meeting, Hotel Statler, New York, November 27-December 2.

American Pharmaceutical Manufacturers Association, Waldorf-Astoria Hotel, New York, November 28-30.

22nd Exposition of Chemical Industries, Grand Central Palace, New York, November 28-December 3.

Society for Experimental Stress Analysis, annual meeting, Hotel New Yorker, New York, November 30-December 2.

American Institute of Chemical Engineers, annual meeting, William Penn Hotel, Pittsburgh, Pa., December 4-7.

National Association of Insecticide & Disinfectant Manufacturers, Mayflower Hotel, Washington, D. C., December 5-6.

Society of Applied Spectroscopy, polarized infrared spectra, Socony-Vacuum Training Center, New York, December 6.

Synthetic Organic Chemical Manufacturers Association, annual meeting, Commodore Hotel, New York, December 7.

Society of Cosmetic Chemists, fall meeting, Savoy Plaza Hotel, New York, December 8.

American Chemical Society, Southwest regional meeting, Oklahoma City, December 9.

American Chemical Society, Division of Industrial and Engineering Chemistry, Columbus, Ohio, December 29-30.

American Association for the Advancement of Science, Chemistry Section, annual meeting, Hotel Statler, New York, December 30-31.

American Meteorological Society, 30th anniversary and 104th national meeting, air pollution symposium, St. Louis, Mo., January 3-6.

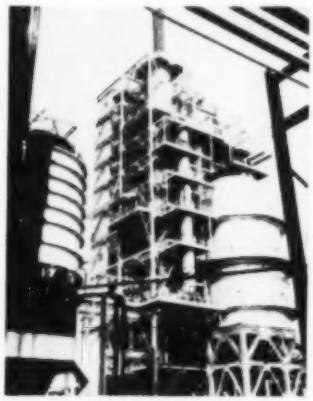
First Plant Maintenance Show, Auditorium, Cleveland, January 16-19.

Compressed Gas Association, Waldorf-Astoria Hotel, New York, January 23-24.

Southwest Air Conditioning Exposition, Fair Park, Dallas, Tex., January 23-27.

American Society of Heating & Ventilating Engineers, 56th annual meeting, Dallas, Tex., January 23-27.

American Standards Association, seminar on industrial standardization, Engineering Societies Building, New York, January 23-27.



Big Cat Cracker First Unit On Stream as Sohio Expands

Its new $11 million fluid catalytic cracking plant went on stream last month at the big Lima refinery of Standard Oil Co. of Ohio.

This shining new unit, with its stack, towers 196½ ft. and is the tallest industrial structure in the state. It has an elevator clear to the top story, first on any unit at the Sohio refinery.

The new catalytic cracker produces 30 percent more gasoline per barrel of crude oil than did its earlier prototypes, thus aiding in the conservation of natural resources.

Every hour it gobbles up about four tank cars of gas oil—one of the distilled products of crude oil—to produce about two tank cars of raw gasoline, plus other products. It is designed to run 16,000 bbl. a day.

Highly automatic, it requires a crew of only six men. And with a total staff of only 30 men, this $11 million tool represents an investment of $366,000 per man.

Built by Arthur G. McKee & Co. in

(*Continued*)

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WITH HOOKER MONOCHLOROACETIC ACID

When monochloroacetic acid enters into the making of your product, you can make it a better product by specifying Hooker Monochloroacetic Acid.

Made in a new specially constructed plant, the Hooker product is technical grade of high quality and uniformity. Right now Hooker Monochloroacetic Acid is available for prompt shipment in the quantities you want.

Listed below are some of the characteristics and Hooker specifications. Technical Data Sheet 752-A gives more complete listing of physical and chemical properties. It will be sent you when requested on your company letterhead.

DESCRIPTION:
White crystalline material with a strong sweetish odor. Corrosive to the skin. Very soluble in water and benzene; soluble in most organic solvents.

USES:
Intermediate in manufacture of carboxymethylcellulose, 2, 4—dichlorophenoxyacetic acid, cyanoacetate, indigoid and thioindigoid dyes, ammonium thioglycolate, thioglycolic acid, glycine and other chemicals of commercial importance. It has been suggested as a preservative alone or in connection with other compounds for hides, skins, etc.

From the Salt of the Earth

HOOKER ELECTROCHEMICAL COMPANY

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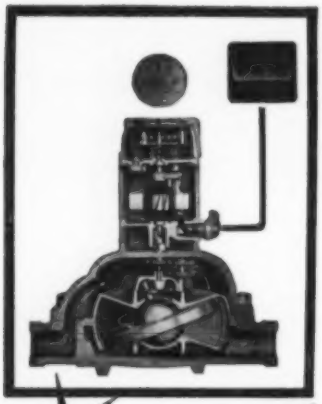

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The HAYS CORPORATION
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News, *cont. . .*

15 months, it is the first unit to be completed in the $30 million expansion and modernization program at Sohio's Lima refinery. When completed next summer, the expansion program will double capacity of the Lima refinery.

Lima will be the northern terminus of the Mid-Valley pipeline from Longview, Tex., now being constructed by Sohio and Sun Oil Co. Work has already started on laying this combination 20-in. and 22-in. line; the section under the Ohio River near Cincinnati is already in place.

From Lima, petroleum products pipelines fan out to serve distribution centers and to connect with Sohio refineries in Toledo, Cleveland and Latonia, across the river from Cincinnati.

An additional petroleum products pipeline from Toledo to the pipeline center at Fostoria will be completed in early December to more than double the transportation capacity between those two points. Lima is connected by pipeline with Fostoria.

In addition to the fluid catalytic cracking plant, Sohio is also constructing a continuous crude and coking unit costing $5.5 million and a new solvent refining plant costing $13,628,000, as well as new tankage totaling 200,000 bbl. and costing $240,000, and a new liquid gas plant costing $225,000, plus an office building and laboratory.

The continuous crude distillation and coking unit, one of the first of its kind in the nation, will produce feed stock, from which high-quality gasoline, furnace oils and petroleum coke for industrial purposes will be made. M. W. Kellogg Co. already has the construction work well along.

The solvent refining plant for lubricating oils will have a capacity of 76,000 gal. of finished solvent-refined lubricating oil a day. This will more than double Sohio's existing capacity for the production of lubricating oils. These are now manufactured at its Cleveland No. 2 refinery and at its Toledo refinery.

Five units of the new Lima lubricating oil plant will provide vacuum distillation, solvent de-asphalting, solvent extraction, solvent de-waxing and clay treating.

M. W. Kellogg Co. will build the solvent de-asphalting unit. The other four units of the plant will be built by Lummus Co.

Combined operations of the three units, together with facilities already at Lima, will make this one of the most economical of Sohio's operations. Gas from the other units will provide the full fuel requirements for the lubricating oil plant and supply the liquid gas plant.

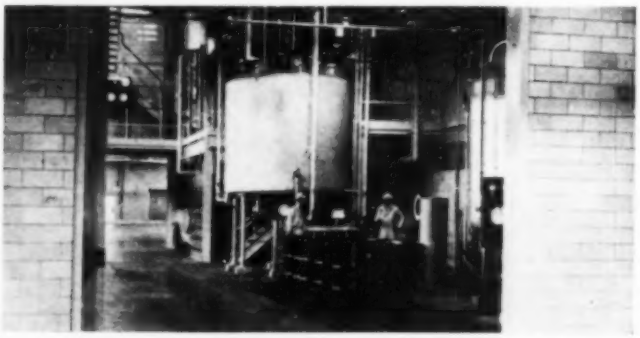
The new solvent refining plant is expected to begin operations in July 1950.

Consultants Elect Officers And Councilors at Meeting

Election of new officers and councilors highlighted the annual meeting of the Association of Consulting Chemists & Chemical Engineers, Inc., held on October 25 in New York.

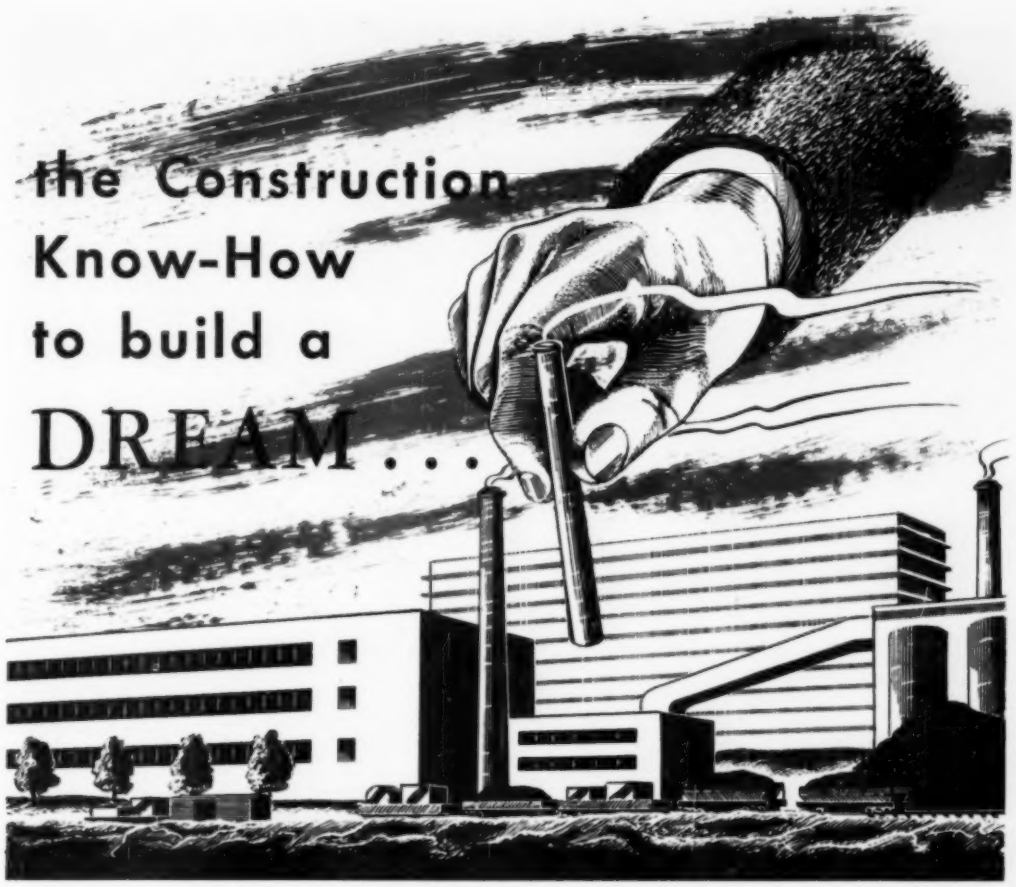
Reelected president was Percy E. Landolt, consulting chemical engineer of New York. Stephen Laufer, Schwarz Laboratories, Inc., New York, was elected vice president; Robert S.

(Continued)



CHEMICAL DERIVATIVES FROM FARM PRODUCTS MADE HERE

Esterification bank at Atlas Point's new derivatives unit. Behind large tank in center are three tiers of reaction kettles. Completed late last year, this new plant of Atlas Powder Co. near Wilmington, Del., turns corn sugars into a variety of useful chemicals, among them a line of emulsifiers for the food, cosmetics and pharmaceutical industries.



Yours is a dream that works . . . You've proven your product in the laboratory . . . it has acceptance . . . and the public is clamoring for it. Now to build a plant to produce it speedily and in sufficient quantity to keep the market supplied. THAT'S WHERE WE COME IN.

Merritt-Chapman & Scott's Industrial Division points with pride to over 3,000 completed projects, totaling hundreds of millions of dollars, as evidence of its ability to do the job. These projects have included pulp and paper mills, oil refineries, steel mills, chemical processing and manufacturing plants, many of them "turnkey" jobs which included the purchase and installation of all machinery.

The secrets of the Corporation's success are its plant and its skilled personnel. Let us show you how the proper blending of this tremendous equipment, experienced personnel and the smooth flow of materials to the job site can bring your project to completion on schedule and with little or no wasted effort.

When you plan construction or an addition, consult your nearest Merritt-Chapman & Scott representative. If you wish more information concerning projects completed, write for our illustrated record of "Industrial Building Activities."

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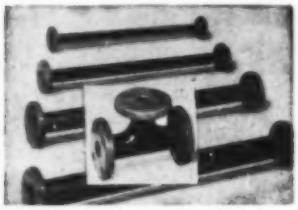
Ducts, vents, hoods, housings, fabricated and/or rubber lined. All joints companion flanged.



★ **PIPE and FITTINGS**

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HISTORIC POUND OF SYNTHETIC METHIONINE

Pound of the vital amino acid from the first commercial lot produced in the new $1 million plant of Dow Chemical Co. at Pittsburg, Calif., is presented to Dow President Leland I. Doan by R. L. Curtis, general manager of the company's Great Western Division. Methionine will go into feeds.

News, cont. . .

Aries, consulting chemical engineer, Brooklyn, N. Y., is the new treasurer; and Albert Parsons Sachs, consulting chemical engineer, New York, the new secretary. All officers serve for one year.

Newly elected councilors, each of whom serves three years, are: Charles Davidoff, consulting metallurgist, New York; Erwin DiCyan, consulting chemist, New York; Chester L. Knowles, consulting chemical engineer, New York; Harry A. Kuhn, consulting chemist, Washington, D. C.; and A. Rooseboom, chemical consultant, New York.

Hold-over councilors include: past President Nicholas M. Molnar, Molnar Laboratories, New York; Robert H. Bell, Lucius Pitkin Inc., New York; Carl Bussow, A. W. Dow Inc., New York; H. W. Dippel, Stillwell & Gladding Inc., New York; Jacques Errera, New York; C. E. P. Jeffreys, Truesdail Laboratories, Los Angeles; Werner Kreidl, Kreidl Physico-Chemical Laboratory, New York; Helman Rosenthal, Dallas Laboratories, Dallas; Herbert R. Simonds, New York; Raymond Stevens, Arthur D. Little, Inc., Cambridge; and A. Taub, College of Pharmacy, New York.

Beryllium for Atomic Work To Come From Ohio Plant

Production of beryllium, a poisonous metal important in atomic energy work, will be in full swing at the plant of the Atomic Energy Commission in Wood County near Luckey, Ohio, by the end of this month.

According to H. W. Schaffner, vice president of the Brush Beryllium Co. of Cleveland, operating the AEC plant, a total of 130 employees have been at work for some time in offices, laboratories and maintenance shops.

Employment is expected to reach between 225 and 250 by the end of the year, Schaffner adds. Just how much beryllium will be produced at the former magnesium reduction plant is an AEC secret.

Sulphuric Acid Plant in Alabama to be Leased

Invitations to bid for the leasing of an oleum plant at the Alabama Ordnance Works, Childersburg, have been issued by Col. W. K. Wilson, Jr., district engineer at Mobile.

The contact process plant has a rated capacity of 400 tons of 100 percent sulphuric acid per 24 hr. The plant and allied facilities, located on about five and one-half acres of land, will be leased for industrial purposes for a term as long as five years.

Briefs . . .

U. S. Foreign Corp. has been appointed exclusive export representative of Mohawk Color & Chemical Corp. in Yugoslavia, Indonesia, Italy and Hong Kong. U. S. Foreign Corp. had already been representing Mohawk in Iran and Iraq and will continue to do so.—*End*

LIFELINE FOR A HEATING PLANT
PENFLEX FLEXIBLE METAL HOSE CUTS CLEANING TIME, ALLOWS QUICK SWITCH OF NOZZLES . . . IS LEAKPROOF FOR LIFE
When the switch was made from coal to oil, in the world's largest manufacturing plant for toys, Penflex was specified in the dual burner oil fired furnace. Fuel lines were needed that would not leak or clog . . . were easily adjusted and maintained.
Here's where Penflexweld, corrugated from one piece of steel or bronze, proved its worth. It is absolutely safe from leakage, flame and high temperatures . . . yet assures flexibility with no danger of metal fatigue. Tight as a pipe but flexible. Penflexweld is invaluable where it is necessary to convey liquids, gases and volatiles of a highly penetrative nature.
Wherever you require flexible tubing in your plant, Penflex has the product and "Flexineering" (the science of applying flexible tubing to fit the particular need) has the answer to save you time, and money in maintenance. Call on Penflex for a complete line of flexible metal hose, tubing and couplings from 1/8" I.D. to 30" I.D. Write for your free copy of "Flexineering."
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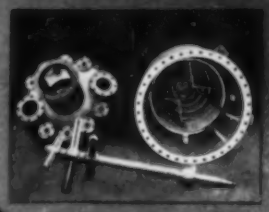
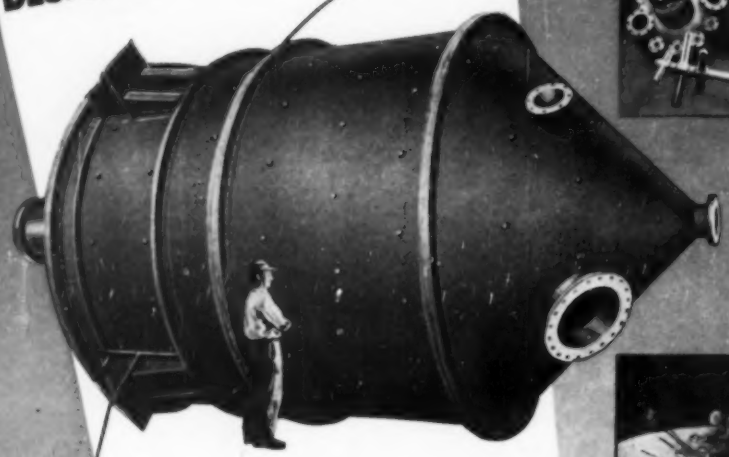
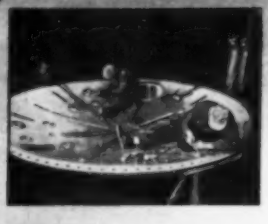
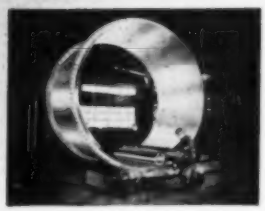
Lead Lined EQUIPMENT

DESIGNED and FABRICATED for BETTER PERFORMANCE









Another example of Acme versatility may be found in the successful fabrication of many unusually difficult lead-lined units. For the processing of acids and other corrosive chemicals, under either atmospheric conditions or under pressure, Acme equipment will be found to meet every critical requirement. Why not permit Acme engineers to bring their general wealth of experience to a solution of your problem?

ACME Processing Equipment

CO. GARLAND, TEX.

Men, Machines and Methods

ROGER WILLIAMS, Jr., Associate Editor

FRED A. OTTO—in last month's election he was the man in the middle.

An Election Can Mean Nothing—*or* You Too Can Be Hurt by Taft-Hartley Problems

Last month an election was held at Du Pont's big Belle, W. Va., plant to determine whether or not the Gas, Coke & Chemical Workers (CIO) should be the bargaining agent for the plant. The election was not too important, by itself. But it was another step in a labor problem that should be more widely known. It is a case where the Taft-Hartley Law has handicapped plant management in its attempts to settle who, if anyone, should be the plant's bargaining agent.

The actual election results were no union, 1,519 votes, and the CIO, 1,283 votes.

The problem at Belle is a squabble between the CIO's Chemical Workers and Denny Lewis' UMW District 50. Belle's plant manager, Fred Otto, would like nothing more than an election with (1) UMW, (2) CIO, and (3) No Union on the ballot. But there is where he stubs his toe on the Taft-Hartley Act. The CIO will only accept an NLRB election, and NLRB certification if it wins. The UMW cannot be on an NLRB ballot, because John L. Lewis (communist-hater, though he is) will not sign the non-communist pledge which Taft-Hartley requires.

All of which leaves the plant management right in the middle.

Here is a brief history of the events leading up to the present election:

In 1945 a three-way election was held. Involved were the UMW, the CIO, the ACE (an independent, the Association of Chemical Employees, which had been the bargaining agent), and, of course, no union. On the first ballot, UMW and ACE were the leaders, but neither had a majority of the votes cast. So a run-off election was held and the UMW won, 1,123 to 772.

A year later, in September 1946, the UMW was challenged again. But UMW won easily. The result: UMW, 1,708; CIO, 501; ACE, 494.

Two years later, the CIO again claimed a majority and demanded an election. But meanwhile the Taft-Hartley Act had been passed, and UMW had refused to comply with the act by signing non-communist pledges. So the election merely had the CIO and "no union" on the ballot.

UMW thereupon campaigned for a "no union" vote. When "no union" won, by the skin of its teeth (1,616 to 1,551), UMW claimed that all the "no union" votes were really "for UMW" votes and wanted continued recognition from Du Pont. The company said "no."

Then, UMW pulled its members out on strike. The strike was never much of a success. Most of the employees stayed on the job, eating and sleeping in the plant. There was some violence, rocks thrown, cars turned over, beatings. Then an injunction limited pickets to two per gate, and the state police enforced it.

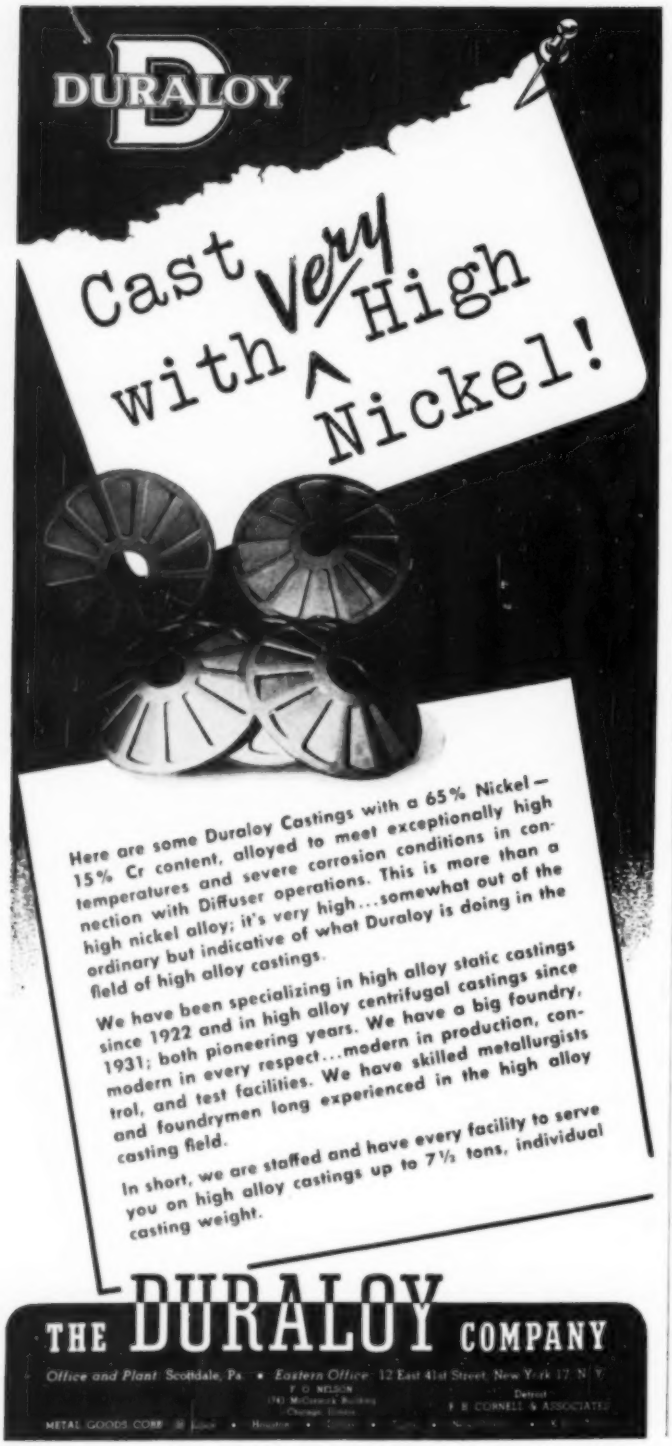
Finally, the UMW gave up. The strike ended with several UMW employees not returning to their jobs. So the plant began operating without a union.

Then in March, this year, the UMW approached the plant manager, Fred Otto, claiming that it had the necessary members to be the bargaining agent (2,100 cards, according to Michael Widman, the UMW representative). After some discussion, Otto agreed to hold an election at the plant. But he insisted on three things: (1) "all unions claiming a substantial membership among the employees be given a place on the election ballot, and (2) abide by the results for one year." (3) A neutral party, agreeable to all interested groups, conduct the election.

UMW agreed to this idea and sought out the West Virginia Commissioner of Labor. He agreed to run an election. So he called a meeting of the company, UMW, and CIO. The result: the CIO refused to go on the ballot, saying that the only election that would have any legal standing would be one run by the National Labor Relations Board.

In the CIO's own words (from their publication "CIO Blocks" circulated at the plant), "A meeting was called in the office of the State Department of Labor on April 14, 1949, to which we were invited on one day's notice. We were given no understanding as to the purpose of the meeting. When we arrived, we found representatives of District 50 and the Com-

(Continued)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M M & M, *cont. . .*

pany. After much of their double talk, we discovered that the meeting had been arranged at the request of the Company and District 50. They had already agreed that they wanted an election conducted either by the State Department of Labor, or some other disinterested party. *Definitely, C.I.O. will not let Du Pont workers down by agreeing to any arrangement dictated by the Company.*"

So, that was the end of that idea.

The next move was for CIO to petition NLRB for an election, which they did immediately after this. NLRB held hearings and finally granted the election. (There was another small problem when the electricians AFL union wanted a separate bargaining group, but their application was denied.)

The months between the CIO's petition and the election (October 12 and 13) witnessed a bitter fight between UMW and CIO. The fight was carried on mainly in the respective publications of the two unions. Here are some examples:

CIO: "You will be the target of a tide of fake, false, and phoney propaganda. . . Let it pass. . . Mr. Habicht [former plant manager], after many years of futile effort, finally succeeded in landing *No Union* at the Belle Plant. Presumably, Mr. Habicht has won a well-merited promotion for that wonderful effort on behalf of the workers. Mr. Otto, his successor, not only wishes to emulate that great deed, but hopes to go one better and, with tears in his eyes and his voice trembling with emotion, begs and pleads for this phoney election, all in the interest of peace, *fair play* and the workers' welfare. CIO REFUSED TO BE A PARTY TO SUCH CONNIVING ON THE PART OF THE COMPANY AND IT'S ALLIES. CIO REFUSED TO SELL THE BELLE WORKERS DOWN THE POLLUTED KANAWHA RIVER."

The UMW answered: "Gromyko of Russia has vetoed constructive proposals in the United Nations time and time again to prevent free democratic speech. Now the CIO Gas & Cokeys veto in Charleston a proposal to allow Belle duPont workers a free democratic election. . . Will the CIO Cokeys ever learn? Evidently not! The 11th verse of the 26th Chapter of Proverbs reads: 'As a dog returneth to his vomit, so a fool returneth to his folly.' On June 28, 1949, between the hours of 10:00 a.m. and 4:30 p.m., the Cokeys returned to their folly. They sat dumbfounded and lost for words in a hearing held in Charleston by the National Labor Relations

(*Continued*)

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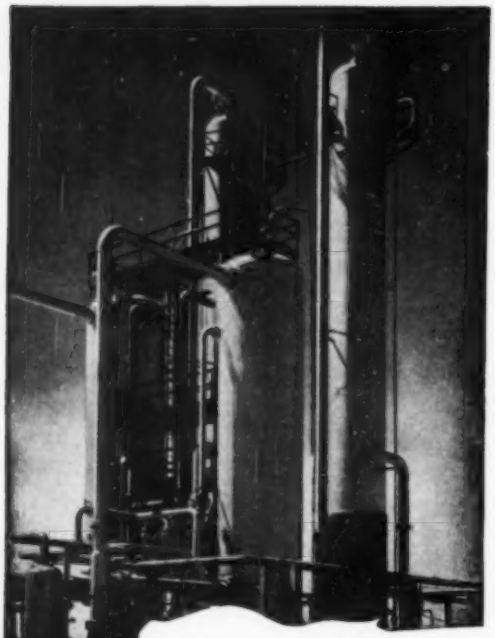

"Hydryer" unit, designed and built by J. F. Pritchard & Company of Kansas City, Mo. A Floridin product is used as the drying agent.

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M M & M, *cont. . .*

Board. Back in April District 50, United Mine Workers of America, told the Cokeys that a *State election was the earliest election.* District 50 also warned that if the Cokeys played with the NLRB, there would be no duPont election by July 1 as the CIO promised time and time again."

All this vilifying boiled down to a few things. UMW campaigned for a "no union" vote, saying (1) vote "no union" and then we will get a private election so you can vote UMW [the company had not promised anything], (2) the CIO is riddled with communists. The CIO campaigned for the election hard, claiming it had thrown out all communists (see CHEM. ENG., Nov. '48, p. 207). CIO put its big guns into the fray—even sent its publicity director, Milton Murray to Belle. Murray is a former president of the Newspaper Guild and an ardent anti-communist (a fact which lost him the presidency of the newspaper union). Behind the UMW drive was Michael Widman, regional director (has since been transferred to Chicago), former Assistant National Organization Director of the CIO.

The net result of all this campaigning and the election has been just what Otto was afraid of—nothing. He still does not know whether or not the employees want a union, and, if they do, whether they want the CIO or UMW. But, as the election came up, Otto worked for a "no union" vote. Said he:

"We have operated this plant for the past 16 months without union representation. We trust that our fair and considerate treatment of employees during this period will cause them to feel, as we do, that a union is not needed at the Belle Works to assist us in our mutual affairs."

The CIO's answer: Otto was "treading on violation of the law."

The employees' answer: "No union" won.

Briefs . . .

Utilities. Here are the average services required at the world's largest organic chemical plant, Du Pont's Chambers Works, over the last 11 years 656,000 pph. of steam, 25,400 kva. of electricity, 11,800 cfm. of compressed air, 44,200 gpm. of river water, 4,570 gpm. of filtered water, 220 gpm. of drinking water, 1,190 cfm. of producer gas, 320 tons per day of refrigeration, and 115,500 lb. per day of ice. Today's requirements are higher since the plant has expanded during the 11 year period. —END

VESSEL DIVISION

NEWS

A.O. Smith 75th Anniversary 1874 - 1949

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CORPORATION

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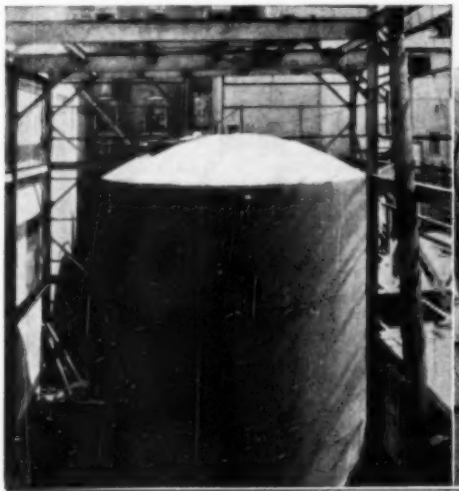
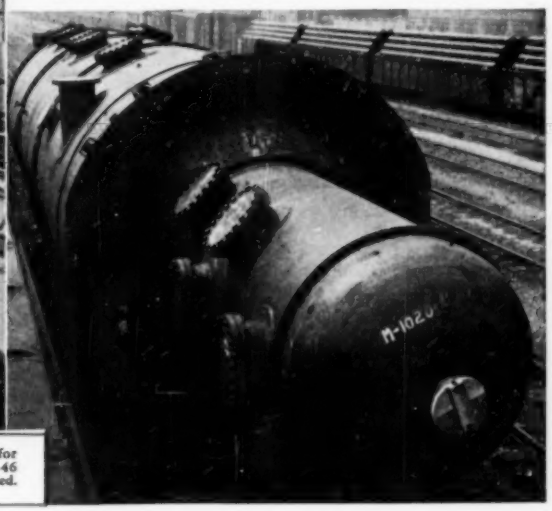
FROM MIDGETS TO GIANTS range the size of pressure vessels and welded structures manufactured in A. O. Smith Vessel plants. To the left is part of an order for 2 ft. dia. x 80 ft. long storage tanks. Below are four huge lined coke drums, 16 ft. dia. by 91 ft., being manufactured simultaneously.

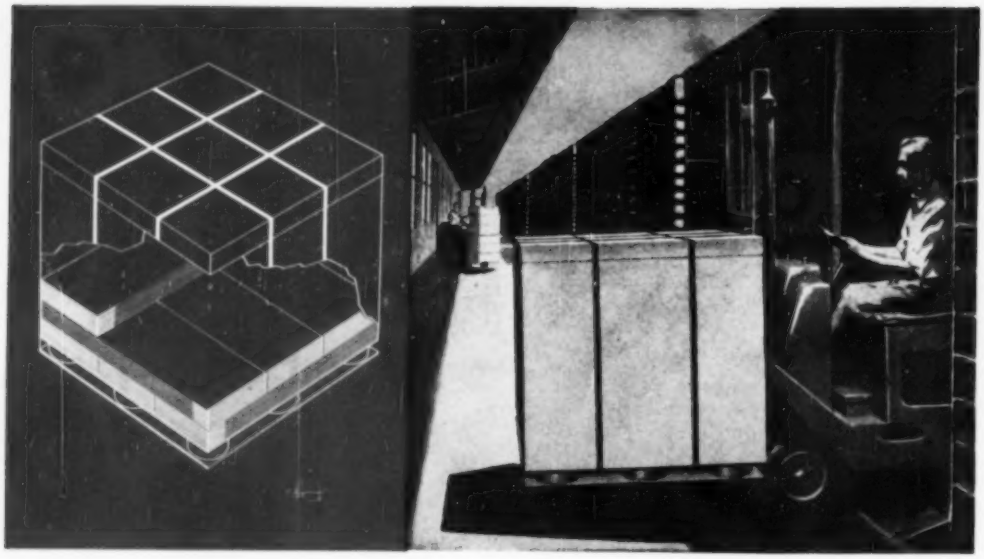
FORERUNNER OF THE FUTURE—Alloy-lined steel acid-storage tanks, like the one shown below, manufactured by A.O. Smith for the paper industry, are replacing existing wooden tanks, which have a limited life. A.O. Smith manufactured the first alloy-lined steel acid-storage tank ever made.



A. O. SMITH IS A LEADER in manufacturing plain carbon steel and corrosion-resistant pressure vessels. This A.O. Smith Vacuum Column, partially lined with type 405 stainless steel, combines extensive knowledge of both types of manufacture.



NEW BULLETINS: Write the nearest A. O. Smith office listed above for these new Bulletins: V-44—Field Assembly of Pressure Vessels; V-46—SMITHway Vessels, Alloy, Alloy-Lined, Clad, and Glass-Lined.



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Handling, Packaging and Shipping

R. W. LAHEY, Editorial Consultant

Keener Competition Spurs the Use of Containers That Serve Customers

The return of competition to the Chemical Industry has caused manufacturers to search for means of making products more attractive to customers. One way of accomplishing this, which is often overlooked, is to choose containers which are easy to handle, store, open and empty a package that will favorably influence costs. In other words the container should create goodwill with customers, storekeepers, superintendents, factory managers, and other workers. These friendly containers can provide an advantage which is quickly appreciated by an anxious sales department. It can often be used to obtain new customers as well as hold old ones.

When the industry recently emerged from the war period of scarcity many products were being packed in any containers that were obtainable. It was better to use packages that did not provide all of the protection needed than to suspend production. As soon as all types of containers were in free supply chemical prices started to soften and it became extremely difficult to justify an increase in cost to change to a more expensive package. This created a do-nothing attitude which lasted until customers, rapidly becoming more critical, insisted that changes be made or even purchased competitive products that were adequately packed.

According to reports, package protection for export shipment deteriorated after hostilities terminated. In fact in some instances this has been so serious that loss of export markets may result. This trend has not been as prevalent in the chemical industry as in some others. Nevertheless, the hue and cry which resulted from claims for damage to shipments by water has pointed the finger at all exporters. Spearheaded by the Maritime Exchange of New York City, the Department of Commerce and Marine Insurance firms an investigation was started last winter to determine and eliminate the reasons for these losses. The results of this investigation are awaited with interest because some shippers are convinced that much of the damage has been caused by handling abuses over which the shipper has no control. The losses are reported to be so serious that the government may prescribe mandatory packing regulations for export shipments if improvement is not forthcoming.

A careful survey of packing practices will disclose what changes are required to correct these unsatisfactory conditions. This survey should include an evaluation of the many types and constructions of containers available today supplemented by a determination of the particular needs of the consuming trade.

Interesting and important information may be developed from a study of customers handling, warehousing and consuming practices. Increased mechanization for the handling of materials and improved methods of manufacturing have changed requirements for packing of many customers. This sometimes creates a demand for new types of containers as well as changes in size and shape.

Although palletized shipments of chemicals have not yet proved to be economically possible, under ordinary conditions the use of fork lift trucks and pallets for intraplant handling and storage has been adopted by a substantial number of users of chemical products. It is therefore necessary that customers' pallet sizes and stacking practices receive consideration in container design.

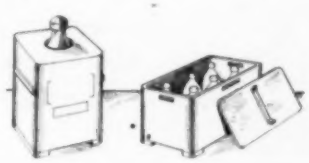
Often it is possible to pack in the quantities that are most economical or convenient for the customer to use. The package should be easy to open and empty with complete reclamation of contents and if all of the compound is not used at once means should be provided for reclosing the container.

Containers such as 18-gage 55-gal. steel drums and fiber drums which have reuse or salvage values are readily acceptable. If it is not practical to use containers that can be reclaimed then the packages should be of such type that they are easily disposed of.

If possible, the use of returnable containers should be avoided. They are a constant source of trouble to tranquil customer relations due to the well known controversies that arise over responsibility for damaged containers and the differences that arise in accounting records involving return of deposits on these packages.

Education of customers' employees in safe handling, warehousing and dispensing from containers is appreciated by the trade. It is especially desirable where products with hazardous characteristics are involved. The technical committees of the Manufacturing Chemists Association have prepared many manuals and safety data sheets which should be used for this purpose. Cautionary labels should always be used on containers holding products with hazardous characteristics.

Many improvements in construction and design of packages have been made by container manufacturers in the last few years. Adoption of these improvements may increase the efficiency of current packing practices. Starting next month a series of short articles on each type of chemical container will appear in this section. This data will include descriptions of recent improvements in package design in the hope that it will prove useful for these surveys of packaging practices.



Carboy Boxes Molded From Laminated Hardwood

A new carboy box has been developed which is of a molded construction using hardwood laminates bonded with urea-formaldehyde resin throughout. It is of five-ply construction with all joints cemented or nailed and cemented. Boxes are protected by a dip coat of a phenolic sealer-varnish.

It is reported that these boxes are over 10 lb. lighter than the conventional type but will withstand static loads of 40,000 lb. They have proved

(Continued)

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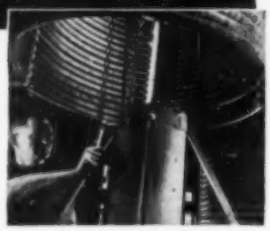
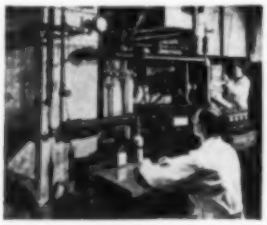
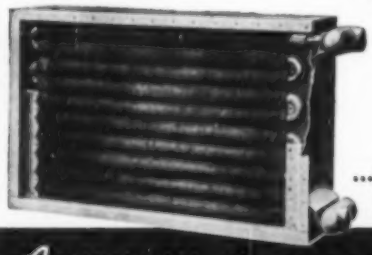


Aerofin manufactures finned heat-transfer surface exclusively. The experience gained by such specialization permits the selection of just the right surface and materials for each particular job — for each application.

Throughout the **CHEMICAL** *Industry—*



Aerofin controls every phase in the production of its finned heat-transfer coils and units. This control is maintained by rigid specifications and inspection, and all assembly is done in the Aerofin plant.



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to withstand outdoor storage without deterioration.

Boxes of this construction are in use for transporting 5 pint bottles of reagent grade mineral acids. These containers are made by Formwood Container Corp., Elkhart, Ind.

Loading and Unloading Platforms for Tank Cars

The Tank Car Committee of the MCA has published Manual Sheet T.C.-7 which describes several safe types of loading and unloading tank car platforms. The hazards attending this work have not only been increased by the mounting volume of products transported in tank cars but by the increased number of compressed gases, flammable liquids and corrosive substances shipped in them.

Platform designed for varying types of tank cars as well as for single and multiple cars are recommended. Pamphlets may be obtained at 20¢ each from the Manufacturing Chemists Association Inc., Woodward Bldg., Washington 5, D. C.

Packaging for the Armed Services

The Navy Industrial Association's Packaging Advisory Committee has been actively advocating that all branches of the Military Establishment adopt uniform packaging requirements and that a standard manual be published for the guidance of industry. Sub-committees are investigating possibilities of improving existing packaging specifications of the Armed Services as well as changes in the interest of uniformity. Among the studies undertaken by other sub-committees are investigation of packaging materials for use in Arctic climates, vapor phase inhibitors, and standardization of can sizes for ordinance packing.

Briefs . . .

Throw away container for refrigerants has been developed by Eston Chemicals, Inc., Los Angeles. An inexpensive container and an adapter have recently been placed on the market. The container weighs about one pound and is available only with Freon-12 at present. The firm plans to package other refrigerants in this "Charge-A-Can" soon. The unit is designed to replace cylinders in recharging small commercial and home-type refrigerating units. Advantages: Cuts losses and avoids contamination.

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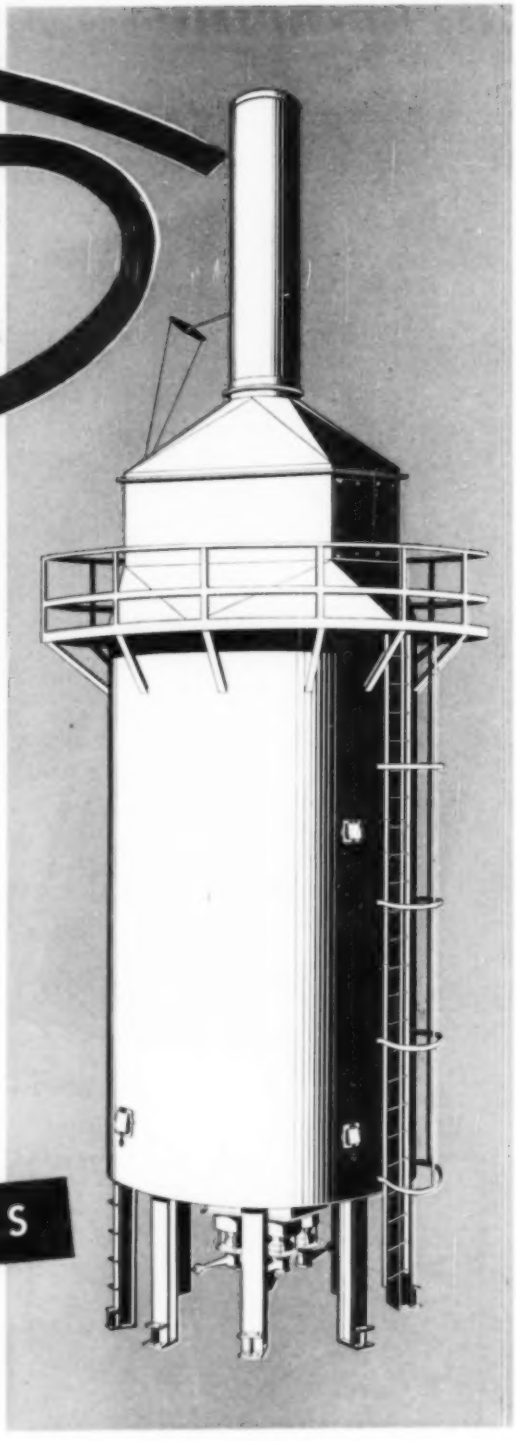

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News From Abroad

SPECIAL CORRESPONDENCE

Gulf Oil Pushes Refining Construction Abroad

Caracas—The Venezuelan Refining Co., subsidiary of the Gulf Oil Co. of the United States, announced that their new $50,000,000 refinery at Puerto La Cruz, State of Anzoategui, will be completed by July 1, 1950. This is six months ahead of the construction schedule originally agreed upon with the Venezuelan government. The refinery, the first to be operated by Gulf in Venezuela as a result of the recent legislation requiring a percentage of the oil produced in the country to be refined here, will have a potential throughput of 30,000 bbl. per day.

Robert M. Baskin, general manager of the refinery, stated the construction program includes housing for 260 families and 56 bachelors and is 99 percent completed. Also to be constructed will be a power plant, telephone exchange, aqueduct and similar utilities for the industrial village. The necessary offices, warehouses and other refinery buildings are also being built.

The refraction towers, cracking unit and other manufacturing structures are being built by Cia. Venezuela Lummus, local subsidiary of the Lummus Construction Corp. The Raymond Concrete Pile Co., and the Hegeman-Harris Construction Co., also U. S. firms, are building the houses, school, aqueduct and electrical plant. Chicago Bridge and Iron Co. is constructing the tank farm.

Bulgarian Reds Clamp Lid On Private Firms

Sofia—Just how completely Bulgaria has shifted in the last 24 months from an economy controlled by private industry to one completely dominated by government was sharply evident at the recent two-week Thirteenth International Trade Fair.

Two years ago all the machinery and industrial exhibits were under the sponsorship of private companies. However, the entire display area in this year's fair, held in the town of Plovidiv, was taken over by state-controlled companies and cooperatives. Not a single exhibit was privately sponsored. Goods of outside concerns, including those of the United States, came under the jurisdiction of the state trading agencies.

Fourteen countries participated in the Plovidiv Fair. Official participants, in addition to Bulgaria, were Russia, Poland, Czechoslovakia, Hungary, and Rumania. Unofficially represented through trading firms were: United States, France, Italy, Switzerland, Belgium, Austria, Holland and England.

Press coverage of the fair emphasized the strong economic ties between Bulgaria and Russia. Published figures, attributed to government sources, revealed that 80 percent of Bulgaria's foreign trade is now carried on with the USSR.

Since the complete nationalization of the country—which followed communist domination in October 1946, several state bureaus have been set up to direct foreign trade. Principal ones are "Metalimport" (metals-machinery), "Himimport" (chemicals-pharmaceuticals), "Industrialimport" (raw materials), and the "Tobacco Monopoly."

Chile Gets New Latex and Plastics Plant

Santiago—An ultra-modern factory unique in its field in South America, will shortly begin production. Known as Implatex (Industria Manufacturera de Telas Plasticas y Latex, S.A.), it will produce plastic films, plastic coated textiles, rigid and extruded plastic products, and latex materials and molded products. An annual gross product of 200 million pesos ($5,000,000) is expected.

This firm has an $0,000,000 peso capital ($2,000,000) investment, all of which has been locally subscribed. All its machinery has been purchased in the United States with the exception of some minor equipment which has been locally built. Technical assistance in new developments in production techniques and products has been obtained by means of a contract with the Rubber Corp. of America, New York.

The unit consists of the following: latex plant, plastic plant, cafeteria, and nursery for children of women workers. With the exception of the second floor offices and laboratories, the plants are jack-knife type structures embodying ultra-modern architectural techniques.

All equipment, including that in the well-equipped physical, process, and chemical laboratories, was made in the United States.

India Develops Use for Castor Oil in Paint

Hyderabad—A process for dehydrating castor oil and making it suitable for use in paints is reported to have been perfected on a laboratory scale by the government research laboratory here. It is claimed that when the dehydrated castor oil is treated with certain earths as catalysts, paints and varnishes made from it attain better drying properties, better color retention and better water resistance than standard linseed oil paints.

The process is of vital interest to Hyderabad which grows 85 percent of the annual Indian castor seed crop, and work on a large-scale process is being pressed.

More Vinyl Resin for Japan's Needs

Osaka—Nissin Chemical Co., Ltd., formerly Sumitomo Chemical Co., is planning to put a 50-ton per month vinyl chloride plant in operation during the spring of 1950. Most of the essential equipment is already available in Sumitomo's former synthetic rubber plant at Niihama, Shikoku. Only conversion of this equipment and construction of a polymerization unit are required.

Production at the start may be limited to 30 tons per month to supply the vinyl chloride requirements of the Sumitomo Electric Industries, Ltd., for coating electric wire. Within two

(Continued)

For the price of any ordinary valve designed for the same purpose, you may have the Hancock Steel Gate WELDVALVE. Built into this valve are twelve superior features whose combined functions give you long life and trouble-free service.

The major factor is that near-diamond hard stellite seats are integral with the WELDVALVE body. How can there ever be leakage? Or anything but infinitesimal wear!

There is the "No Bonnet Joint." Gasket troubles do not exist—nor leakage.

Here are other features:

Dissimilar Materials in Seats and Wedges.
Self-Storing Gland.
No Stem Pitting.
Stainless-To-Stainless Back Seating.
Gland Nut Threads Protected.
Packing Ease.
Ball Bearing Stem-To-Wedge Connection.
Safe, Comfortable Handwheel.
Interchangeable Parts.
Baked Enamel Exterior Finish.

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(*Continued*)

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SPECIFY
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WITH CONFIDENCE

- OPERATE DRY or SUBMERGED IN DYES, PLATING, CLEANING & CHEMICAL SOLUTIONS, GASOLINE, FOODSTUFFS
- TRULY OILLESS AND SELF-LUBRICATING
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- EXTENSIVELY USED IN CONVEYORS, PUMPS & OVENS
- ROTATING SEALS OF GRAPHALLOY ARE UNEXCELLED

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suppliers are therefore clearly intended to give them an advantage over other, from the currency point of view, less desirable suppliers in the British market.

In the export field the sterling devaluation has so far been felt chiefly in the form of an increase in the number of inquiries reaching British manufacturers from overseas customers, but the flow of orders has not increased yet to any appreciable extent. In accordance with the advice received from the President of the Board of Trade, British exporters will lower dollar prices only where necessary to meet foreign competition in goods capable of expanded shipments abroad. In the chemical field they will certainly be able to meet competition from continental Europe in the coal-tar products section where it is hoped to increase sales in the U. S. market. In general, however, little hope is placed on an expansion of chemical sales to North America. On the other hand, British chemicals, dyes and drugs will have a greater chance now against foreign produce in the contested markets of South and Central America, the Middle East and some European countries. To make the most of existing opportunities in these markets, some observers consider some kind of pooling and cooperative arrangements indispensable. The example of the Associated Paint Manufacturers Ltd., a venture in which 140 small and medium-sized British paint firms are cooperating successfully in the export field, is quoted with approval by the authorities.

Production of phenol-formaldehyde molding powder and Perspex sheeting has begun in the new Imperial Chemical Industries factory at Wilton near Middlesborough. Extensions of the company's factory at Grangemouth near Glasgow, estimated to cost £370,000, have been approved.

British Glues and Chemicals Ltd. has opened a new factory at Newark and has started the manufacture of several new grades of specialized adhesives.

Hess Products Ltd. has commenced construction work on a new plant at Littleborough in Lancashire for the production of close-cut fatty acid fractions by a process developed by Armour & Co. of Chicago and hopes that the new plant, first of its kind outside the United States, will be in production by January 1950.

Lewis Berger and Sons Ltd. announced that the new large factory at Chadwell Heath would start up for trial runs in October. Several new paints based on styrene have been introduced by the company and are helping greatly to maintain the sales turnover.

Distillers Co. Ltd. are engaged in carrying out plans for a substantial increase in capacity of the penicillin factory at Speke, Liverpool. Next year new materials are to be made at Speke. Distillers' plastics manufacturing operations are being gradually transferred to the new factory at Barry which is reported to be virtually complete. The company has received a license for the erection of a new yeast factory at Bristol.

Machinery has begun to arrive from the United States for the £37,500,000 oil refinery being built for the Anglo-American Oil Co., a subsidiary of the Standard Oil Co. of New Jersey, at Fawley near Southampton. Construction work is over a month ahead of schedule.

Lawes Chemical Co. reports that its plans for a sulphuric acid plant have had to be changed "owing to supplies of raw materials being affected by the government's monetary program" but hopes to proceed with the erection of a different plant at an early date.

Goodlass Wall and Lead Industries Ltd. whose new paint factory at Liverpool commenced production early in 1949 has found it "necessary to re-examine projects which, under more favorable economic and political conditions, would have been carried forward without question."

SOCAL Plans Refinery In Venezuela

Caracas—The Richmond Oil Co., subsidiary of Standard Oil of California, is presently negotiating with the Venezuelan government for construction of a new refinery here. Richmond, which has large petroleum development and exploration concessions on the western shores of Lake Maracaibo, has done no manufacturing to date in Venezuela. The government recently passed legislation requiring that a percentage of all oil produced here must be refined locally.

Company officials refused to comment concerning this new development, however, reliable sources indicate that the refinery will have a capacity of about 15,000 bbl. throughput per day, will cost $25,000,000, and that the bid for construction will be let about the first of the year. It is also understood that the Cia. Venezuela Lummus, subsidiary of the U. S. firm the Lummus Construction Corp., are the principal builders under consideration by Richmond. The new project is to be located near Maracaibo, State of Zulia. —*End*

"This Trap can't leak steam . . ."

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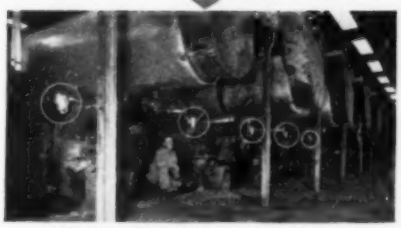
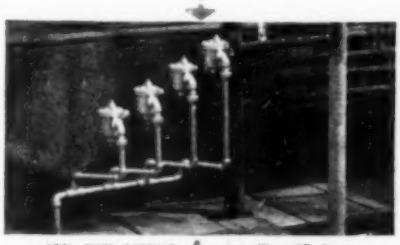


$300 PER MONTH fuel saving with 17 Armstrong traps on jacketed kettles and expeller tempering troughs. The traps cost $316. More than 1000% return per year! — *Pacific Nut Oil Co., Los Angeles.*



20% FUEL SAVING since installing 57 Armstrong traps on heating coils makes the coal pile last longer at *Norton Greenhouse, St. Paul.* Heating-up time has been cut in half, too.

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RESULT: You save steam, fuel and money, minimize back pressure in your return lines.

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ARMSTRONG STEAM TRAPS

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UNEQUALED EXPERIENCE

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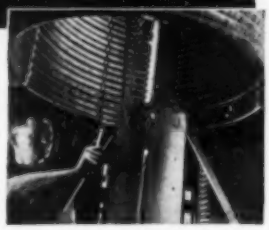
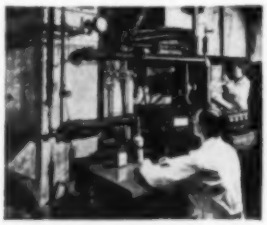
When you specify Aerofin finned heat-transfer surface, you specify high efficiency, long life and easy maintenance. As pioneer in the field, Aerofin has developed unequaled know-how and production facilities to apply to your particular heat-transfer application. Attention to the many details that make up the completed unit typifies the Aerofin way.

Continual research accounts for the accuracy of Aerofin's published ratings. You can use them with full confidence.

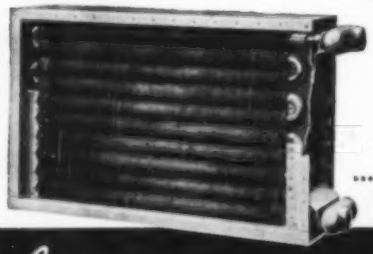


Aerofin manufactures finned heat-transfer surface exclusively. The experience gained by such specialization permits the selection of just the right surface and materials for each particular job — for each application.

Throughout the **CHEMICAL** *Industry-*



Aerofin controls every phase in the production of its finned heat-transfer coils and units. This control is maintained by rigid specifications and inspection, and all assembly is done in the Aerofin plant.



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to withstand outdoor storage without deterioration.

Boxes of this construction are in use for transporting 5 pint bottles of reagent grade mineral acids. These containers are made by Formwood Container Corp., Elkhart, Ind.

Loading and Unloading Platforms for Tank Cars

The Tank Car Committee of the MCA has published Manual Sheet T.C.-7 which describes several safe types of loading and unloading tank car platforms. The hazards attending this work have not only been increased by the mounting volume of products transported in tank cars but by the increased number of compressed gases, flammable liquids and corrosive substances shipped in them.

Platform designed for varying types of tank cars as well as for single and multiple cars are recommended. Pamphlets may be obtained at 20¢ each from the Manufacturing Chemists Association Inc., Woodward Bldg., Washington 5, D. C.

Packaging for the Armed Services

The Navy Industrial Association's Packaging Advisory Committee has been actively advocating that all branches of the Military Establishment adopt uniform packaging requirements and that a standard manual be published for the guidance of industry. Sub-committees are investigating possibilities of improving existing packaging specifications of the Armed Services as well as changes in the interest of uniformity. Among the studies undertaken by other sub-committees are investigation of packaging materials for use in Arctic climates, vapor phase inhibitors, and standardization of can sizes for ordinance packing.

Briefs . . .

Throw away container for refrigerants has been developed by Eston Chemicals, Inc., Los Angeles. An inexpensive container and an adapter have recently been placed on the market. The container weighs about one pound and is available only with Freon-12 at present. The firm plans to package other refrigerants in this "Charge-A-Can" soon. The unit is designed to replace cylinders in recharging small commercial and home-type refrigerating units. Advantages: Cuts losses and avoids contamination.

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This NEW, 40-page bulletin probably contains more information on "what is available" in mills and related equipment than has ever before been published in one manual.

Here you will find a table of sizes, capacities, power requirements, overall dimensions and other data on standard mills . . . general specifications, including details of a number of attachments . . . parts lists of single and twin mill units . . . and more than thirty illustrations of designed-for-the job mills (ranging from 6" to 28" in size), complete with descriptions of the special features of each. Also illustrated are refiners, washers and crackers, as well as other F-B processing units. The Farrel-Birmingham process-testing laboratory, where manufacturers are invited to explore the possibilities of new processing techniques, and the company's specialized engineering service are also described.

If you buy, specify or are in charge of the operation of this type of equipment, you should have a copy of this fact-filled bulletin. FB-558

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DOWTHERM HEATING
AT
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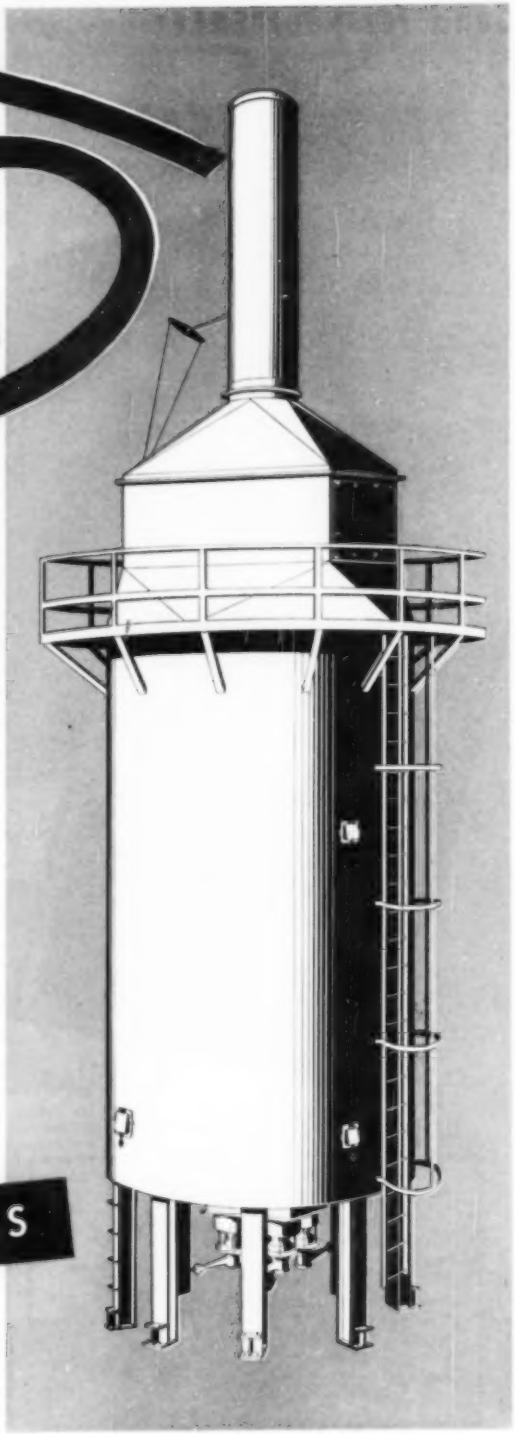

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The Struthers Wells direct fired Dowtherm heating system is widely used for heating reactors, evaporators, stills and similar equipment. Large units, in operation for many years, have given trouble-free service at operating temperatures of 750° F. or higher. No other available equipment can equal this record.

The system utilizes a pump circulation type vaporizer. For batch processes requiring subsequent cooling, the same pump and circulating system may be used in conjunction with a cooler. Equipment is supplied complete if required, including controls, safety devices and other accessories. High thermal efficiencies may be secured. Except in largest sizes, equipment is supplied completely shop assembled.

If your process requires high temperatures and freedom from operating difficulties, we will be glad to offer our recommendations. Descriptive Bulletin A-45 is available on request.

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News From Abroad

SPECIAL CORRESPONDENCE

Gulf Oil Pushes Refining Construction Abroad

Caracas—The Venezuelan Refining Co., subsidiary of the Gulf Oil Co. of the United States, announced that their new $50,000,000 refinery at Puerto La Cruz, State of Anzoategui, will be completed by July 1, 1950. This is six months ahead of the construction schedule originally agreed upon with the Venezuelan government. The refinery, the first to be operated by Gulf in Venezuela as a result of the recent legislation requiring a percentage of the oil produced in the country to be refined here, will have a potential throughput of 30,000 bbl. per day.

Robert M. Baskin, general manager of the refinery, stated the construction program includes housing for 260 families and 56 bachelors and is 99 percent completed. Also to be constructed will be a power plant, telephone exchange, aqueduct and similar utilities for the industrial village. The necessary offices, warehouses and other refinery buildings are also being built.

The refraction towers, cracking unit and other manufacturing structures are being built by Cia. Venezuela Lummus, local subsidiary of the Lummus Construction Corp. The Raymond Concrete Pile Co., and the Hegeman-Harris Construction Co., also U. S. firms, are building the houses, school, aqueduct and electrical plant. Chicago Bridge and Iron Co. is constructing the tank farm.

Bulgarian Reds Clamp Lid On Private Firms

Sofia—Just how completely Bulgaria has shifted in the last 24 months from an economy controlled by private industry to one completely dominated by government was sharply evident at the recent two-week Thirteenth International Trade Fair.

Two years ago all the machinery and industrial exhibits were under the sponsorship of private companies. However, the entire display area in this year's fair, held in the town of Plovidiv, was taken over by state-controlled companies and cooperatives. Not a single exhibit was privately sponsored. Goods of outside concerns, including those of the United States, came under the jurisdiction of the state trading agencies.

Fourteen countries participated in the Plovidiv Fair. Official participants, in addition to Bulgaria, were Russia, Poland, Czechoslovakia, Hungary, and Rumania. Unofficially represented through trading firms were: United States, France, Italy, Switzerland, Belgium, Austria, Holland and England.

Press coverage of the fair emphasized the strong economic ties between Bulgaria and Russia. Published figures, attributed to government sources, revealed that 80 percent of Bulgaria's foreign trade is now carried on with the USSR.

Since the complete nationalization of the country—which followed communist domination in October 1946, several state bureaus have been set up to direct foreign trade. Principal ones are "Metalimport" (metals-machinery), "Himimport" (chemicals-pharmaceuticals), "Industrialimport" (raw materials), and the "Tobacco Monopoly."

Chile Gets New Latex and Plastics Plant

Santiago—An ultra-modern factory unique in its field in South America, will shortly begin production. Known as Implatex (Industria Manufacturera de Telas Plasticas y Latex, S.A.), it will produce plastic films, plastic coated textiles, rigid and extruded plastic products, and latex materials and molded products. An annual gross product of 200 million pesos ($5,000,000) is expected.

This firm has an 80,000,000 peso capital ($2,000,000) investment, all of which has been locally subscribed. All its machinery has been purchased in the United States with the exception of some minor equipment which has been locally built. Technical assistance in new developments in production techniques and products has been obtained by means of a contract with the Rubber Corp. of America, New York.

The unit consists of the following: latex plant, plastic plant, cafeteria, and nursery for children of women workers. With the exception of the second floor offices and laboratories, the plants are jack-knife type structures embodying ultra-modern architectural techniques.

All equipment, including that in the well-equipped physical, process, and chemical laboratories, was made in the United States.

India Develops Use for Castor Oil in Paint

Hyderabad—A process for dehydrating castor oil and making it suitable for use in paints is reported to have been perfected on a laboratory scale by the government research laboratory here. It is claimed that when the dehydrated castor oil is treated with certain earths as catalysts, paints and varnishes made from it attain better drying properties, better color retention and better water resistance than standard linseed oil paints.

The process is of vital interest to Hyderabad which grows 85 percent of the annual Indian castor seed crop, and work on a large-scale process is being pressed.

More Vinyl Resin for Japan's Needs

Osaka—Nissin Chemical Co., Ltd., formerly Sumitomo Chemical Co., is planning to put a 50-ton per month vinyl chloride plant in operation during the spring of 1950. Most of the essential equipment is already available in Sumitomo's former synthetic rubber plant at Niihama, Shikoku. Only conversion of this equipment and construction of a polymerization unit are required.

Production at the start may be limited to 30 tons per month to supply the vinyl chloride requirements of the Sumitomo Electric Industries, Ltd., for coating electric wire. Within two

(*Continued*)

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What this valve will do for you

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- TRULY OILLESS AND SELF-LUBRICATING
- EXTREMELY DURABLE
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- EXTENSIVELY USED IN CONVEYORS, PUMPS & OVENS
- ROTATING SEALS OF GRAPHALLOY ARE UNEXCELLED

GRAPHITE METALLIZING CORPORATION
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suppliers are therefore clearly intended to give them an advantage over other, from the currency point of view, less desirable suppliers in the British market.

In the export field the sterling devaluation has so far been felt chiefly in the form of an increase in the number of inquiries reaching British manufacturers from overseas customers, but the flow of orders has not increased yet to any appreciable extent. In accordance with the advice received from the President of the Board of Trade, British exporters will lower dollar prices only where necessary to meet foreign competition in goods capable of expanded shipments abroad. In the chemical field they will certainly be able to meet competition from continental Europe in the coal-tar products section where it is hoped to increase sales in the U. S. market. In general, however, little hope is placed on an expansion of chemical sales to North America. On the other hand, British chemicals, dyes and drugs will have a greater chance now against foreign produce in the contested markets of South and Central America, the Middle East and some European countries. To make the most of existing opportunities in these markets, some observers consider some kind of pooling and cooperative arrangements indispensable. The example of the Associated Paint Manufacturers Ltd., a venture in which 140 small and medium-sized British paint firms are cooperating successfully in the export field, is quoted with approval by the authorities.

Production of phenol-formaldehyde molding powder and Perspex sheeting has begun in the new Imperial Chemical Industries factory at Wilton near Middlesborough. Extensions of the company's factory at Grangemouth near Glasgow, estimated to cost £370,000, have been approved.

British Glues and Chemicals Ltd. has opened a new factory at Newark and has started the manufacture of several new grades of specialized adhesives.

Hess Products Ltd. has commenced construction work on a new plant at Littleborough in Lancashire for the production of close-cut fatty acid fractions by a process developed by Armour & Co. of Chicago and hopes that the new plant, first of its kind outside the United States, will be in production by January 1950.

Lewis Berger and Sons Ltd. announced that the new large factory at Chadwell Heath would start up for trial runs in October. Several new paints based on styrene have been introduced by the company and are helping greatly to maintain the sales turnover.

Distillers Co. Ltd. are engaged in carrying out plans for a substantial increase in capacity of the penicillin factory at Speke, Liverpool. Next year new materials are to be made at Speke. Distillers' plastics manufacturing operations are being gradually transferred to the new factory at Barry which is reported to be virtually complete. The company has received a license for the erection of a new yeast factory at Bristol.

Machinery has begun to arrive from the United States for the £37,500,000 oil refinery being built for the Anglo-American Oil Co., a subsidiary of the Standard Oil Co. of New Jersey, at Fawley near Southampton. Construction work is over a month ahead of schedule.

Lawes Chemical Co. reports that its plans for a sulphuric acid plant have had to be changed "owing to supplies of raw materials being affected by the government's monetary program" but hopes to proceed with the erection of a different plant at an early date.

Goodlass Wall and Lead Industries Ltd. whose new paint factory at Liverpool commenced production early in 1949 has found it "necessary to re-examine projects which, under more favorable economic and political conditions, would have been carried forward without question."

SOCAL Plans Refinery In Venezuela

Caracas—The Richmond Oil Co., subsidiary of Standard Oil of California, is presently negotiating with the Venezuelan government for construction of a new refinery here. Richmond, which has large petroleum development and exploration concessions on the western shores of Lake Maracaibo, has done no manufacturing to date in Venezuela. The government recently passed legislation requiring that a percentage of all oil produced here must be refined locally.

Company officials refused to comment concerning this new development, however, reliable sources indicate that the refinery will have a capacity of about 15,000 bbl. throughput per day, will cost $25,000,000, and that the bid for construction will be let about the first of the year. It is also understood that the Cia. Venezuela Lummus, subsidiary of the U. S. firm the Lummus Construction Corp., are the principal builders under consideration by Richmond. The new project is to be located near Maracaibo, State of Zulia. —End

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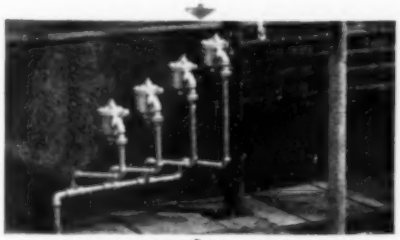

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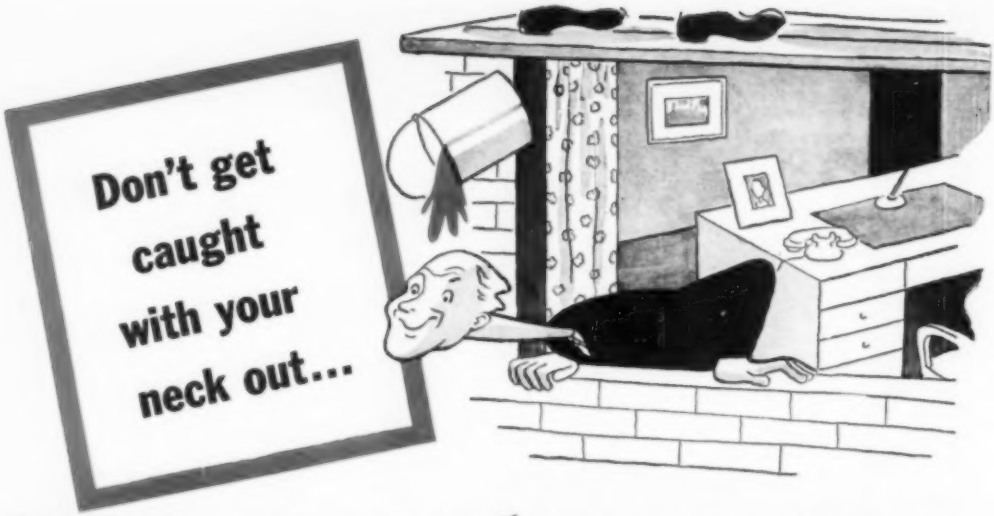

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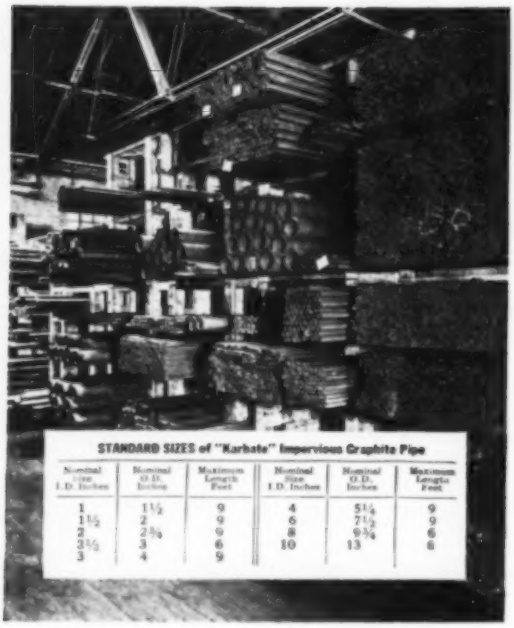

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1	1½	9	4	5¼	9
1½	2	9	6	7½	9
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The Corrosion Forum

EDMOND C. FETTER, Managing Editor

Fluorine versus Construction Materials

A symposium in which several manufacturers of construction materials have evaluated their products for services involving fluorine.

Carbon and Graphite

J. F. Revilock and N. J. Johnson, *National Carbon Co., Cleveland, Ohio*

The use of carbon is not limited in fluorine applications by concentration, temperature, or contaminants, precluding strong oxidants. While carbon is generally preferred to graphite in contact with elemental fluorine, there are particular types of fluorine applications in which graphite and Karbate impervious graphite are also employed. In general, the use of the latter is limited to those applications where all, or most, of the fluorine has been reacted with water. Installation of carbon spray towers equipped with graphite baffles and Karbate impervious graphite spray nozzle assemblies is increasing in the scrubbing systems used for removal and recovery of fluorine stack gases, particularly in the phosphoric acid and fertilizer industries. The fluorine is scrubbed from the gas with water or alkalis.

In many electrothermic processes, such as the production of phosphorous, carbon electrodes and furnace hearths show complete resistance to the corrosive action of the fluorine present and are universally accepted as standard in the industry.

Carbon in Fluorine Cells:—In the development of the modern electrolytic fluorine cell with its severe corrosive conditions involving high concentrations of active elemental fluorine and anhydrous hydrofluoric acid at temperatures of 100 deg. C. and higher, the anode from the beginning presented a major problem. The employment of a special grade of carbon finally proved the answer to the anode problem, but before this development, a number of different materials were subject to testing and evaluation. For example, nickel anodes offer some promise, but over long periods of time were found to be impractical because of a relatively high corrosion rate and ensuing contamination of the electrolyte with nickel salts even at minimum cell temperatures of 75 to 80 deg. C.

Graphite, although reasonably resistant to attack in fluorine cells operated at a temperature of near 250 deg. C., reportedly suffers very severe swelling and disintegration due to the formation of graphite-hydrofluoric acid salt-like compounds and nonconducting carbon fluorides at a cell temperature of about 100 deg. C., the range at which the most practical electrolytic fluorine cells are operated with a molten KF·2HF electrolyte.

In the modern, low temperature fluorine cell operated at near 100 deg. C. with a pure, water-free molten KF·2HF electrolyte carbon anodes show little evidence of anodic corrosion, and if the electrolyte could be maintained free of oxygen impurities, carbon anodes would likely last almost indefinitely.

Stainless Steel

W. G. Renshaw, *Allegheny Ludlum Steel Corp., Brackenridge, Pa.*

Because the production of fluorine in commercial quantities has only begun in the last few years, relatively little experience with the stainless steels for such applications has been obtained. The extreme chemical activity of gaseous fluorine with most substances would make the problem of storage and handling very difficult except for the fact that fluorine does not react with the metal fluorides. Although no metals actually resist attack by the gas the formation of a thin adherent film of the metallic fluoride will protect against further attack by fluorine.

The stainless steels are suitable at room temperature for handling and storing fluorine gas. Type 440 has been employed in valve parts for handling tank fluorine gas. Intermediate temperatures up to about 400 deg. F. do not cause any severe attack by fluorine, but at higher temperatures, due to predominance of iron in the stainless composition, the metallic fluorides on the surface become thick, porous and adhere too loosely to offer suitable protection to the metal.

As with other metals, stainless steel is subject to heating and actual ignition by high velocities of fluorine gas past the surface sufficient to remove the protective metallic fluorides. Heating occurs because fluorine can freely combine with the metal, and the heat of reaction is very high as chemical combination takes place. Leaks in high pressure fluorine systems can cause this type of hazard with most of the metals used in handling this gas particularly when oil, grease or other contaminants are also present.

Lead

Kempton H. Roll, *Lead Industries Assn., New York, N. Y.*

In contact with fluorine gas, particulary in the presence of moisture, lead is transformed into the fluoride. Behaving somewhat like lead sulphate, the fluoride coating or film on the lead surface prevents or substantially decreases further reaction. At temperatures up to at least 100 deg. C., lead is known to handle fluorine gas safely.

Lead fluoride is soluble in nitric acid or sulphuric acid; insoluble in acetic acid, hydrofluoric acid or ammonia. Its solubility in water at 20 deg. C. is 0.064 g./100 ml.

Often when fluorine encounters lead, it is only a minor constituent of other corrosive gases. Many ore roasting operations, for example, frequently evolve fluorine gas along with sulphur dioxide and other gases. In the recovery of these gases, particularly when converting to sulphuric acid, lead lined ducts and chambers are often employed. A large Belgian zinc ore roasting plant purges fluorine from its roaster gases by means of several types of lead equipment, all of which have performed successfully for many years.

Fluorine removal is necessary in order to assure purity of the sulphur dioxide before conversion to sulphuric acid by the contact process. From the

(*Continued*)

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Symposium on Caustic Soda

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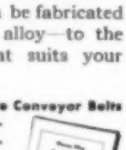

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roasters, the hot gases containing fluorine are conveyed through water cooled lead coils and thence through lead ducts into the defluorinating chamber. The latter is lined with sheet lead and constructed in such a manner that the fluorine is removed by solution in a water spray. The use of lead in handling hydrofluoric acid, one of the products of this reaction, was described in these columns in October.

Lead is regularly used as a washer in an adaptor assembly for external connections to the cylinder valves in use with compressed fluorine.

It thus appears that an important but restricted usage of lead is found in industry for combating corrosion by fluorine under various conditions of concentration, temperature and moisture content.

Iron and Steel

A. W. SPITZ, *Registered Professional Engineer, Elkins Park, Pa.*

Fluorine at low pressures and temperatures under 400 deg. C. can be safely handled in low carbon iron and carbon steel piping, with forged steel valves, either bellows sealed or packed with a suitable material such as Teflon. To minimize corrosion, the silicon content of the metal should be as low as possible. All welded construction is recommended with the least possible number of flanged connections. Screwed fittings are not recommended.

Worthite

W. E. PRATT, *Worthington Pump & Machinery Corp., Harrison, N. J.*

Worthite is not classed as material of construction economically suitable for fluorine or hydrofluoric acid. For anhydrous HF it would not be affected but since steel is suitable, Worthite would not be considered. While Worthite would be more resistant then steel to strong aqueous solutions of HF, it is well known that Monel is much more resistant and there would be no economic reason for using Worthite. At concentrations below 60 percent HF, Worthite is severely corroded with a tendency to corrode rapidly in crevices and underneath the surface of cast material while showing relatively little attack on the outside shell.

Certain mixtures containing HF or free fluorine may show fair to good corrosion resistance, but the record in this respect is spoty and in no case should Worthite be used without a preliminary check with specimens exposed to the solution under simulated or actual service conditions. Fluoborate plating solutions are not corrosive to Worthite and many Worthite pumps are used for circulating and filtering such solutions in the plating industry.

The following case histories and results of corrosion tests will serve as a guide in considering construction materials for some of the more common solutions involving fluorine and hydrofluoric acid:

1. A fertilizer plant used Worthite hot rolled bars for making shafts for bronze pumps handling up to 26 percent HF. Solution probably contained H_2SiF_6 which may have acted as an inhibitor. While Worthite was not recommended, the plant used it for several years until a more economical material was found.

2. Another plant uses Worthite pumps for handling 12 percent HF at 100 deg. F. Impurities are present. Impellers last six months and casings much longer.

3. Crude H_3PO_4 up to 75 percent concentration and up to 205 deg. F., containing approximately 0.5 percent HF has been handled very successfully in Worthite pumps and valves. A test pump is now being used on hot, crude H_3PO_4 containing approximately 3 percent HF.

4. A mixture of 90 percent H_2SO_4 and 10 percent HF at room temperature showed a corrosion rate of 10 mils per yr. The user considers Worthite to be satisfactory.

Not Recommended

Chemical Stoneware

Chemical stoneware, being a saliceous material, is non-resistant to the attack of fluorine and should not be used under any conditions with this material.—F. E. HERSTEIN, *General Ceramics Co., Keasbey, N. J.*

Tantalum

Tantalum reacts with fluorine and most of its compounds.—ALLAN L. PERCY, *Fansteel Metallurgical Corp., North Chicago, Ill.*

Aluminum

We have no firsthand experience with fluorine itself, and, of course, flourine compounds are numerous and variable in their action on aluminum. Certain of the fluorine compounds, such as Freon 12, are compatible with aluminum alloys, while those which hydrolyze to form hydrofluoric acid cause corrosion of aluminum under moist conditions.—ELLIS D. VERINK, JR., *Aluminum Company of America, New Keinsington, Pa.* —*End*

Durco Announces: A MORE EFFICIENT SELF-PRIMING PUMP FOR CORROSIVE SERVICE

NEW DESIGN CUTS PRIMING TIME 66⅔% AIR-HANDLING CAPACITY GREATLY INCREASED

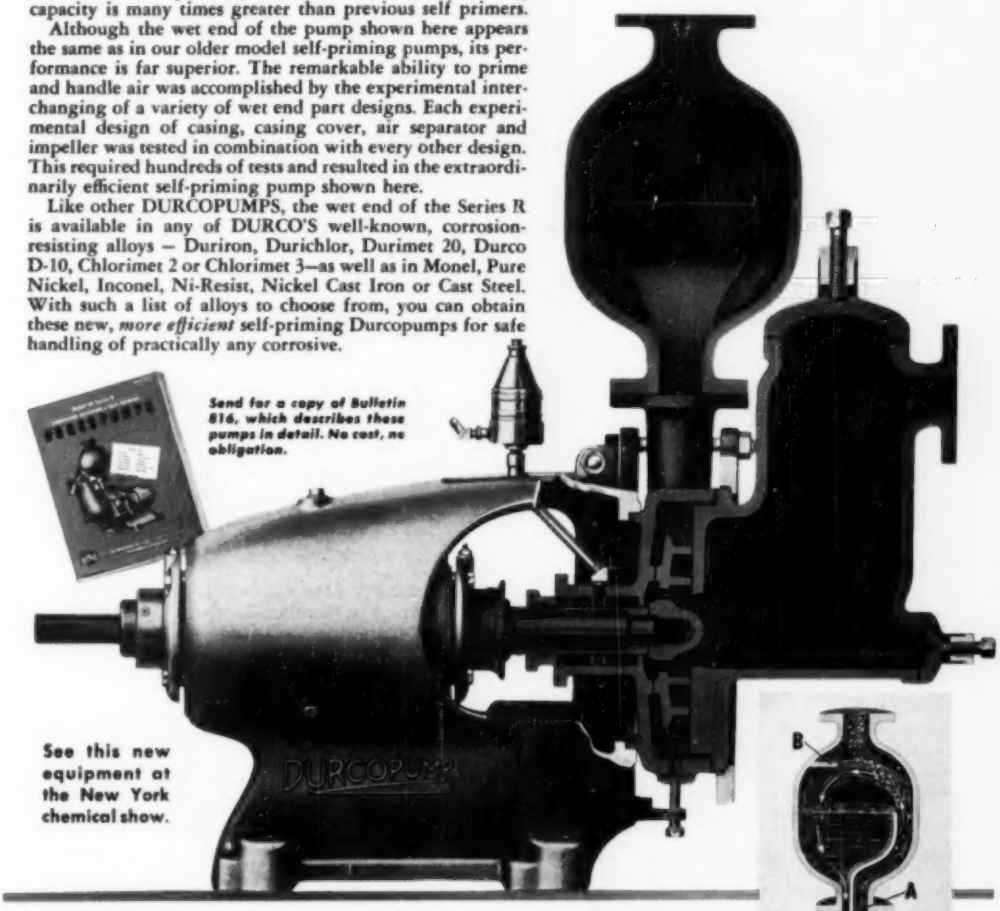
As the result of twenty-five years of producing self-priming pumps and testing our own pumps and others, we say, "This is the finest self-priming pump available today for handling corrosive solutions."

Thoroughly tested in the field by customers, as well as in our own plant, test records show that priming time is only one-third that required by earlier models, and air-handling capacity is many times greater than previous self primers.

Although the wet end of the pump shown here appears the same as in our older model self-priming pumps, its performance is far superior. The remarkable ability to prime and handle air was accomplished by the experimental interchanging of a variety of wet end part designs. Each experimental design of casing, casing cover, air separator and impeller was tested in combination with every other design. This required hundreds of tests and resulted in the extraordinarily efficient self-priming pump shown here.

Like other DURCOPUMPS, the wet end of the Series R is available in any of DURCO'S well-known, corrosion-resisting alloys — Duriron, Durichlor, Durimet 20, Durco D-10, Chlorimet 2 or Chlorimet 3—as well as in Monel, Pure Nickel, Inconel, Ni-Resist, Nickel Cast Iron or Cast Steel. With such a list of alloys to choose from, you can obtain these new, *more efficient* self-priming Durcopumps for safe handling of practically any corrosive.

Send for a copy of Bulletin 816, which describes these pumps in detail. No cost, no obligation.



See this new equipment at the New York chemical show.

This drawing shows how the Series R DURCOPUMP operates in priming. When the pump is started, the water is thrown upward into the air separator through port A, while air is drawn in from the suction line at the eye of the impeller. Water and air pass into the air separator. The water, baffled by plate B, returns through port C. The air passes into the discharge line. When the air in the suction line is evacuated, the impeller discharges liquor through both ports A and C.

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Can You Benefit by The Many Useful properties of DICALITE Mineral Fillers?

DICALITE MINERAL FILLERS are produced from diatomaceous silica. They are amorphous in character (not crystalline), comparatively soft and friable, and free from gritty matter. Following data give the range of properties of the many grades of Dicalite available for filler use.

Colors	gray white, buff, white
Refractive Index	1.40 to 1.48
Particle Size	from all through 150 to trace on 325 mesh screen
Weight (loose)	8 to 13 lbs. cu. ft.
Surface Area	20,000 to 100,000 sq. ft. per lb.
Porosity	approximately 90%
Melting Point	approximately 2900° Fahr.

LIGHT WEIGHT—This factor is often utilized to reduce shipping and packing costs. The loose weight of Dicalite filler materials varies from 7 to 13 pounds per cubic foot according to grade. The apparent specific gravity is 0.112 to 0.21; actual specific gravity is 2.00 to 2.35.

STRUCTURE—Diatom structure of the individual particles is responsible for many of the desirable filler properties of Dicalite. Instead of being approximately spherical, each particle is irregular with a predominance of acicular and elongated shapes. Such particles form an interlacing "strawpile" pattern that reinforces and strengthens—an effect particularly noticeable in paint films, asphalt mixes, molded goods, etc.

VAST SURFACE AREA—Because of the diatom structure mentioned above, Dicalite fillers have a tremendous surface area per unit of weight. Each particle is irregular in shape and porous as well. This property is of decided benefit when the material is used as a source of silica, as a diluent for insecticides, as a carrier for catalysts, etc.

HEAT RESISTANCE—Dicalite materials have a melting point of approximately 2900° F. In addition, their high porosity makes them very poor conductors of heat. Thus, Dicalite not only improves heat resistance but reduces the heat conductivity of a material or product of which they are a part.

CHEMICAL INERTNESS—Composed of silicon dioxide (SiO_2), Dicalite filler materials are chemically inert, and can be used in compounding without special formulation in regard to reactions.

POROSITY AND ABSORPTIVENESS—Porosity or voids of Dicalite fillers will average 90%. Depending on the liquid and grade of material, absorptiveness will vary from 120% to 300% of the weight of the Dicalite. Wetability of all materials is excellent.

PARTICLE SIZE—Materials may be supplied for special purposes with virtually any particle size. The filler grades regularly supplied range from substantially all through 150 mesh screen to 1% retained on a 325 mesh screen. Predominating particle size is usually between 2 and 6 microns.

A Dicalite Engineer will be glad to discuss your specific application. Call or write any Dicalite office.

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DICALITE MINERAL FILLERS

Names in the News

MAN OF THE MONTH

E. V. Murphree

E. V. Murphree, president of Standard Oil Development Co., has been announced as recipient of this year's Perkin Medal. This high honor, made annually for outstanding work in applied chemistry, is to be presented January 6 in New York at the meeting of the American Section of the Society of Chemical Industry.

Eger Vaughan Murphree was born at Bayonne, N. J., 51 years ago. When he was eight his parents moved to Louisville. After he finished high school, he went to Kentucky University where he majored in chemistry and mathematics (and football). He obtained his M. S. in 1921 and accepted a teaching-coaching job at Parris High School in Illinois.

The following year he went to Massachusetts Institute of Technology where he remained until 1924, first as staff assistant and later as research associate in the laboratory of applied science. During this period he worked with W. H. McAdams and W. K. Lewis on the development of chemical engineering principles and published a number of papers on the theory of crystallization, heat transfer and distillation.

While at M.I.T. he developed considerable interest in the industrial application of chemical engineering and left in 1924 to accept a position as chemical engineer with Solvay Process Co. In 1926 he was placed in charge of the chemical engineering division at Solvay.

In 1930 Mr. Murphree left Solvay to accept a position as director of a new group being formed by the Standard Oil Co. (N. J.) to develop chemical processes utilizing petroleum raw materials. Two years later his duties were expanded to include all development and research work at Baton Rouge when he was named director of the development and research department of the Standard Oil Co. of Louisiana. In 1936 he was transferred to New York as manager of development and research for the Standard Oil Development Co., in 1938 was elected vice president and in 1947 he was named president.

Fluid catalytic cracking, 100-octane gasoline, synthetic toluene, butadiene and hydrocarbon synthesis are all fields in which Mr. Murphree has made notable contributions.

During the war he served as a member of the Office of Scientific Research and Development committee which was instrumental in the establishment of the Manhattan Project. Prior to the organization of that committee, Mr. Murphree was chairman of the Planning Board which was responsible for the technical and engineering aspects of the work, for procurement of materials and for construction of pilot plants and full-size production plants. In addition he was in charge of the design of a heavy water plant in British Columbia and supervised much of the work on the centrifugal method of separating uranium isotopes.

Dr. Murphree received his honorary D.Sc. this year from the University of Kentucky. He is a member of ACS, API and SCI as well as AIChE.

He lives in Summit, N. J., with Mrs. Murphree and their 13-year-old daughter. His hobbies are golf, photography and music.

Fred G. LaPiana has been appointed director of textile research of Stein, Hall & Co., New York. He formerly served as head of the company's Providence, R. I., textile laboratory.

F. G. LaPiana

L. A. Hatch

Lloyd A. Hatch, vice president of the Minnesota Mining and Mfg. Co., St. Paul, has been assigned the job of coordinating research and new product development.

Harry K. Collins has been named manager of the newly-formed laminated and insulating products division of General Electric Co., Pittsfield. **Herbert B. Brusman** will replace him as the manager of the plastics division.

Julius Kovitz has been appointed general manager in charge of all chemical and metallurgical operations at the Brooklyne Chemical Works, Inc., Baltimore, Md.

Malcolm E. Carson, formerly chief chemist of Baltimore Paint and Color Co., has joined the staff of the products development laboratory of the Arco Co., Cleveland, Ohio.

Joseph A. Orsino, George Vahrenkamp, Charles H. Moore and **Edwin P. Peterson** have been made assistants to the director of research, National Lead Co., New York.

George Alexander has been appointed process engineer of the phenolic products plants of the chemicals division of the General Electric Co.'s chemical department. **James J. Pyle** has been named division engineer of the newly-established laminated and insulating products division. **T. Norman Willcox** has been appointed manufacturing and materials engineer of the same division.

R. A. V. Raff has started research work in the field of plastics at Mellon Institute. Dr. Raff, a native of Vienna known for his work on high polymers, is the holder of a fellowship sustained by Koppers Co.

A. C. Fieldner

R. A. V. Raff

Arno C. Fieldner, chief of the fuels and explosives division of the

(Continued)

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For installation in wood or metal chutes, ducts, pipes, conveyors, spouts, etc.

Whether for machinery protection or to keep your products pure, the Dings Perma-Plate Magnet is engineered to meet your needs by the concern which has been magnetic separation headquarters for all industry since 1899 — your assurance of satisfaction. Write for literature today.

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Note the raised pole faces, utilizing the concentration of magnetic flux which will occur at a magnet's edge to best advantage. This design feature assures positive holding of magnetic material.

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NAMES IN THE NEWS, cont. . .

United States Bureau of Mines, has been given the Distinguished Service Award and Gold Medal by the Department of the Interior in recognition of his contributions to fuel technology.

Paul D. Merica, executive vice president of the International Nickel Co. of Canada, Ltd., has been elected a director of the Babcock & Wilcox Co.

D. B. Coghlan, formerly with Du Pont, has joined the research and development staff of Foote Mineral Co., Philadelphia.

Arnold E. Pitcher has retired as general manager of Du Pont's plastics department after nearly 40 years with the company.

Harwood F. Merrill has been appointed general manager of the paint and varnish division of the Eagle Picher Co., Cincinnati. He has also been made vice president of the Eagle-Picher Sales Co.

Maxwell P. Sweeney has been appointed assistant professor of chemical engineering at the University of Pennsylvania. **Gordon MacBeth** has been appointed instructor in chemical engineering.

Stanley Chaberek, Jr., has been added to the research staff of the Houdry Process Corp., Linwood, Pa.

Walter Hull Aldridge has been elected to receive the John Fritz medal for 1949.

George D. Graves has been named director of the fabrics and finishes department's chemical division at E. I. du Pont de Nemours & Co., Wilmington.

William J. Sparling has been elected vice president and manager of the chain and transmission division of Chain Belt Co., Milwaukee. **E. P. Meyer** succeeds him as works manager.

Ju Chin Chu has been named associate professor in chemical engineering at the Polytechnic Institute of Brooklyn. He was formerly director of research in the department of chemical engineering at Washington University, St. Louis, Mo.

William L. Walsh, East Greenbush, N. Y., has been named assistant general manager of the general ani-

(Continued)

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*Above rates are for U. S. and U. S. possessions ONLY.

CANADA: $4 ☐ 1 year . . . . . $4 ☐ 2 years . . . . . $8 ☐ 3 years (payable in Canadian or U. S. funds.)
LATIN AMERICA: $10 ☐ 1 year . . . . . $16 ☐ 2 years . . . . . $20 ☐ 3 years.
OTHER COUNTRIES: $15 ☐ 1 year . . . $25 ☐ 2 years . . . $30 ☐ 3 years. 11-49

NEW SUBSCRIPTION ORDER

1 year of "CHEMICAL ENGINEERING" for $3* ☐

☐ I will pay when you bill me. ☐ I enclose remittance.

☐ 3 YEARS FOR $5* OR ☐ 2 YEARS FOR $4*

Name _____ Position _____

Home Address _____

City _____ Postal Zone _____ State _____

Company _____

*Above rates are for U. S. and U. S. possessions ONLY.

CANADA: $4 ☐ 1 year . . . . . $4 ☐ 2 years . . . . . $8 ☐ 3 years (payable in Canadian or U. S. funds.)
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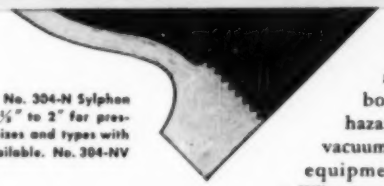
OTHER COUNTRIES: $15 ☐ 1 year . . . $25 ☐ 2 years . . . $30 ☐ 3 years. 11-49

PHON
KLESS
LVE



Illustrated: cutaway view of No. 304-N Sylphon packless valve. Sizes from ⅛" to 2" for pressures up to 150 lbs. Larger sizes and types with flanged connections also available. No. 304-NV is ideal for vacuum service.

● Here's a valve that can save you time and money — protect you and your equipment to boot! It stops even tiniest leaks of valuable or hazardous liquids or gases, prevents waste, provides vacuum protection . . . and helps guard you and your equipment against explosion, fire and other damage. ● What's more, Sylphon packless valves never require re-packing — because there isn't any! A rugged, dual-ply seamless metal Sylphon bellows replaces the customary stuffing box. It provides a seal that stops costly leaks for good. ● And the bellows is metal-housed for protection against erosion. It seals the valve stem against corrosive, dangerous or inflammable liquids or gases. ● Installed on pipe lines carrying oil, gasoline or other volatile liquids or vapors, Sylphon packless valves are widely used in chemical plants, oil refineries, power plants, aboard ships. ● Get complete information — just write for free Bulletin VC-813.

Temperature Controls • Bellows Devices • Bellows Assemblies

FULTON SYLPHON
DIVISION

FIRST WITH BELLOWS

ROBERTSHAW-FULTON CONTROLS CO. KNOXVILLE 4, TENN.

Canadian Representatives, Darling Brothers, Montreal

FIRST CLASS
PERMIT No. 64
(Sec. 34.9, P.L.&R.)
NEW YORK, N. Y.

BUSINESS REPLY CARD
No Postage Stamp Necessary If Mailed In The United States

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CHEMICAL ENGINEERING
330 WEST 42nd STREET
NEW YORK 18, N. Y.

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PERMIT No. 64
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BUSINESS REPLY CARD
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330 WEST 42nd STREET
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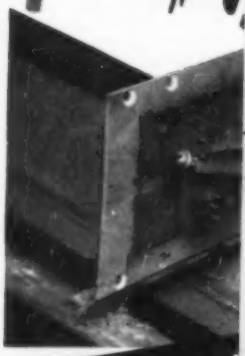
$7



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inexpensive Dings Al
valuable equipment w
tion available.* With
guarded forever again

Consider these advantages and gain the same protection for YOUR machinery.

- Low Initial Cost
- Non-Electric
- No Operating or Maintenance Expense
- Magnetic Permanence Guaranteed
- Handles Either Wet or Dry Materials

For installation in wood or metal chutes, ducts, pipes, conveyors, spouts, etc.

Whether for machinery protection or to keep your products pure, the Dings Perma-Plate Magnet is engineered to meet your needs by the concern which has been magnetic separation headquarters for all industry since 1899 — your assurance of satisfaction. Write for literature today.

*Name of customer on request.

Note the raised pole faces, utilizing the concentration of magnetic flux which will occur at a magnet's edge to best advantage. This design feature assures positive holding of magnetic material.

DINGS MAGNETIC SEPARATOR COMPANY
4720 West Electric Avenue, Milwaukee 14, Wis.

50 Years the Leader!

Dings
MAGNETIC SEPARATION
HIGH INTENSITY
Reg. U. S. Pat. Off.

Process Corp., Linwood, Pa.

Walter Hull Aldridge has been elected to receive the John Fritz medal for 1949.

George D. Graves has been named director of the fabrics and finishes department's chemical division at E. I. du Pont de Nemours & Co., Wilmington.

William J. Sparling has been elected vice president and manager of the chain and transmission division of Chain Belt Co., Milwaukee. **E. P. Meyer** succeeds him as works manager.

Ju Chin Chu has been named associate professor in chemical engineering at the Polytechnic Institute of Brooklyn. He was formerly director of research in the department of chemical engineering at Washington University, St. Louis, Mo.

William L. Walsh, East Greenbush, N. Y., has been named assistant general manager of the general ani-

(Continued)

It stops costly leaks for good ... never needs re-packing!

SYLPHON PACKLESS VALVE

Illustrated: cutaway view of No. 304-N Sylphon packless valve. Sizes from ½" to 2" for pressures up to 150 lbs. Larger sizes and types with flanged connections also available. No. 304-NV is ideal for vacuum service.

● Here's a valve that can save you time and money — protect you and your equipment to boot! It stops even tiniest leaks of valuable or hazardous liquids or gases, prevents waste, provides vacuum protection ... and helps guard you and your equipment against explosion, fire and other damage. ● What's more, Sylphon packless valves never require re-packing — because there isn't any! A rugged, dual-ply seamless metal Sylphon bellows replaces the customary stuffing box. It provides a seal that stops costly leaks for good. ● And the bellows is metal-housed for protection against erosion. It seals the valve stem against corrosive, dangerous or inflammable liquids or gases. ● Installed on pipe lines carrying oil, gasoline or other volatile liquids or vapors, Sylphon packless valves are widely used in chemical plants, oil refineries, power plants, aboard ships. ● Get complete information — just write for free Bulletin VC-813.

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FIRST WITH BELLOWS

Temperature Controls • Bellows Devices • Bellows Assemblies

FULTON SYLPHON
DIVISION

ROBERTSHAW-FULTON CONTROLS CO. KNOXVILLE 4, TENN.

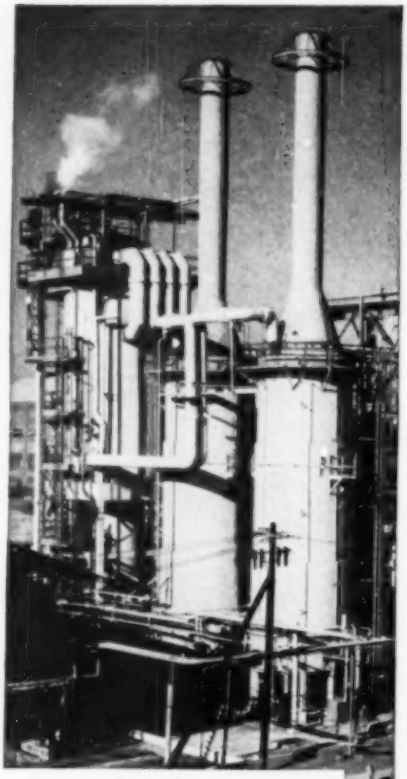
Canadian Representatives, Darling Brothers, Montreal

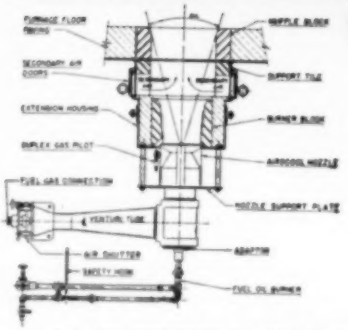
NATIONAL AIROIL FUEL OIL · GAS BURNERS

WIDELY USED THROUGHOUT INDUSTRY . . .

UP-FIRED
OIL-GAS
TANDEM
COMBUSTION
UNITS

Yes, because of their extreme adaptability, "National Airoil" Vertical TANDEM COMBUSTION UNITS have been widely used throughout the petroleum industry. The TANDEM UNIT has a high turn-down ratio with a steady flame . . . maintains a high flame temperature with either fuel oil or gas; can be brought quickly to full capacity with a clean flame; and flame can be regulated and directed to uniformly radiate heat to the absorbing surfaces without impingement. The TANDEM COMBUSTION UNIT is also designed for firing horizontally, and for forced draft preheated air when necessary. It may also be applied to all types of boilers and process furnaces. Write for details about the TANDEM COMBUSTION UNIT and the various types available.





This diagrammatic drawing is of the National Air-oil OIL-GAS TANDEM COMBUSTION UNIT (firing vertically upward) . . . widely used and popular in oil refineries throughout the nation.

OIL BURNERS and GAS BURNERS for industrial power, process and heating purposes; STEAM ATOMIZING OIL BURNERS; MOTOR-DRIVEN ROTARY OIL BURNERS; MECHANICAL PRESSURE ATOMIZING OIL BURNERS; LOW AIR PRESSURE OIL BURNERS; GAS BURNERS; COMBINATION GAS and OIL BURNERS; AUTOMATIC OIL BURNERS, for small process furnaces and heating plants; FUEL OIL HEATERS; FUEL OIL PUMPING and HEATING UNITS; FURNACE RELIEF DOORS, AIR INTAKE DOORS, OBSERVATION PORTS; SPECIAL REFRACTORY SHAPES.

NATIONAL AIROIL BURNER CO., INC.

Main Offices & Factory: 1235 EAST SEDGLEY AVENUE, PHILADELPHIA 34, PA.
Texas Office: 2512 South Boulevard, Houston 6

INDUSTRIAL OIL BURNERS, GAS BURNERS, FURNACE EQUIPMENT

NAMES IN THE NEWS, cont. . .

line works' division of General Aniline & Film Corp., New York. **Joseph W. Lang** has been made assistant plant manager at the division's Rensselaer plant.

P. W. Bachman

A. W. Worrall

Paul W. Bachman has been made manager of the newly-formed department of development planning of the Davison Chemical Corp., Baltimore. **A. W. Worrall** has been appointed works manager of the company's Curtis Bay plant. He was formerly with the Houdry Process Corp.

Louis F. Warrick has been made senior sanitary engineer for the Public Health Service, Federal Security Agency.

T. W. Jones and **Arthur T. E. Binsted** have formed the Binjon Press, London, England, to publish a monthly journal, *The Bottler and Packer*.

L. P. Moore has been appointed manager of the new products development department of American Cyanamid Co., New York.

Charles Allen Thomas has been elected chairman of the executive committee of Monsanto Chemical Co., St. Louis, Mo. Dr. Thomas was formerly executive vice president of the company.

Lucius D. Clay, former commander of the armed forces in Europe and Military Governor in Germany, has been named president of the Ecusta Paper Corp. at Pisgah Forest, near Brevard, N. C. He succeeds **Harry H. Straus** who becomes chairman of the board.

Carroll A. Hochwalt, Monsanto Chemical Co. vice president and director, has been named to head the company's research, development and patent activities.

John E. Kinney has been made a sanitary engineer on the staff of the Ohio River Valley Water Sanita-

(*Continued*)

Vinyl upholstery coverings are among the hundreds of fast-selling products in the manufacture of which Barrett "ELASTEX" 28-P Plasticizer is used to advantage.

announcing

BARRETT "ELASTEX"

28-P Plasticizer (Dioctyl Phthalate)

Newest Addition to the Barrett Line of Plasticizers

Dioctyl Phthalate is the most widely used plasticizer for vinyl resins. Its very low volatility, good low temperature characteristics, and excellent heat and light stability have recommended its use wherever rigid service conditions must be met.

▶ **OTHER BARRETT* CHEMICALS AVAILABLE TO THE PLASTICS INDUSTRY:**

Dibutyl Phthalate • "ELASTEX" DCHP Plasticizer • "ELASTEX" 10-P Plasticizer • "ELASTEX" 50-B Plasticizer • Phthalic Anhydride • Phenol • Cresols • Cresylic Acids • Toluol

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.
In Canada: The Barrett Company, Ltd., 5551 St. Hubert St., Montreal, Que.

*Reg. U. S. Pat. Off.

Barrett *

Why compounders prefer CIRCO light rubber-processing aid

1 SPECIALLY REFINED FOR RUBBER-PROCESSING

Circo is not an ordinary mineral oil. Circo is a petroleum-base processing aid, refined within rigid specifications solely to meet the exacting requirements of rubber compounders.

2 PRODUCT UNIFORMITY ASSURED

Uniformity is vital to profitable mass production. Circo is refined under precision-controlled conditions, permitting no deviation from specifications. With Circo the danger of variation is minimized.

3 HIGH NAPHTHENICITY

Leading rubber technologists are unanimous in agreeing that hydrocarbons with a *high degree of naphthenicity* are best suited for processing and plasticizing rubber. Sun's exclusive refining process makes possible high naphthenicity in Circo.

4 EASY TO HANDLE

Circo is clean and free-flowing, even in cold weather.

5 FAIR PRICE

To be certain of always getting uniform, top-quality results, leading compounders pay slightly more for Circo. They recognize the need for a precision-produced product, and will not risk failures through the use of low-price petroleum-base oils.

6 "JOB PROVED"

Circo has been used by rubber processors for over 12 years. Hundreds of rubber manufacturers are sold on the performance and durability of goods processed with Circo. They know that such products turn in remarkable service records.

Every user of Circo is entitled to the technical assistance of Sun's specially trained and widely experienced rubber technologists. Such service is rarely available to the user of ordinary petroleum-base oils. For further information, just write or call the Sun Office nearest you.

SUN OIL COMPANY • ***Philadelphia 3, Pa.***
In Canada: Sun Oil Company, Ltd., Toronto and Montreal

SUN PETROLEUM PRODUCTS
"JOB PROVED" IN EVERY INDUSTRY

SUNOCO

tion Commission. He was formerly with Morris Knowles, Inc., Pittsburgh, Pa.

Floyd B. Mitman, Jr., has been assigned as executive officer of the technical command, Army Chemical Center, Edgewood, Md.

M. D. Banus has joined the research staff of Metal Hydrides Inc., Beverly, Mass.

E. H. Ehlert has been appointed region manager of industrial cleaning equipment and chemical sales in the Midwest for Detrex Corp., Detroit.

R. M. MacIntosh has been appointed supervisor of chemical development by Tin Research Institute Inc., Columbus, Ohio. **R. J. Nekervis** has been made supervisor of metallurgical development.

Arthur S. Brown has been appointed president of Clapp Instrument Co., Webster, Mass.

Carroll R. Keim has been made technical representative for the foreign department of the Corn Products Refining Co. **John W. Davey** will replace Mr. Keim as sales representative in Chicago. **David L. Richardson, Jr.**, has been put in charge of the Pittsburgh area.

Roy F. McConnell has retired as vice president in charge of sales and a director of Standard Oil Co. (Indiana). **R. F. Baity** will succeed him as vice president in charge of sales.

Clarence H. Slayton has been appointed manager of the methods and equipment laboratory for General Electric Co., Pittsfield, Mass.

C. H. Hosterman has been appointed manager of the general apparatus department of the Elliott Co., Jeannette, Pa. **Harry A. Erb** has been made assistant to the company's vice president in charge of engineering.

Edward R. Hamm has been appointed manager of the packaging development section, Sharp & Dohme, Philadelphia.

James W. Reynolds has been appointed assistant sales manager of the chemicals division of the chemical department of General Electric Co., Pittsfield, Mass. **Robert G.**

(Continued)

You Need a KENNEDY Electrically Controlled Valve

Where manual operation is too lengthy or too difficult.

Where valve control is desired at a distant point, or at two or more points.

Where a group of many valves must be operated frequently.

KENNEDY furnishes electrically controlled valves, for standard and low pressure services and all standard A.C. and D.C. voltages.

The motor, reduction gearing and limit switches are fully enclosed in a weather-proof housing. Safe, dependable operation is secured through accurately set limit switch with torque seating and thermal overload protection.

Emergency manual operation provided. Handwheel does not turn while valve is operated electrically.

KENNEDY electrically operated valves are ready for use. Setting of limit switch, trial operation and hydrostatic test are all completed at the factory.

KENNEDY Fig. 611G., Top-mounted Electrical Control on Standard, Iron Body, Double-Disc, Gate Valve; Services up to 125 Steam, 175 pounds Water, Oil or Gas; 4" through 60" sizes available.

Check List for Use with Inquiries or Orders

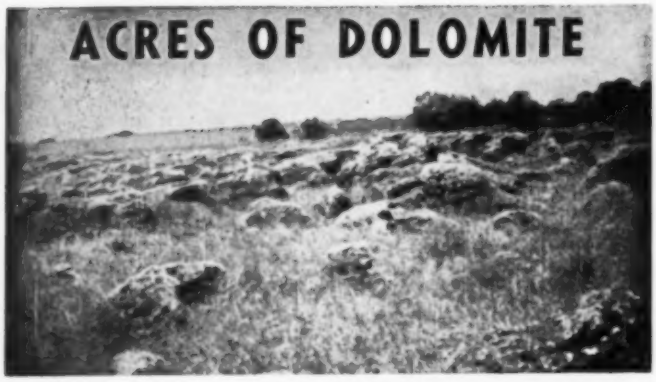
- ☐ Size of valve and whether O.S. & Y. or Non-rising Stem.
- ☐ Working or test pressure and actual unbalanced pressure on discs.
- ☐ Type connection; flanged, bell ends, or special.
- ☐ Position of valve in pipe line.
- ☐ Electric current characteristics; D. C. or A.C. voltage; phase, cycles if A.C.
- ☐ Number of control stations wanted.
- ☐ Brief description of installation; fluid or gas controlled, frequency of operation and function of valve.

Write for complete information. No obligation.

THE KENNEDY VALVE MFG. CO.
1064 EAST WATER ST.
ELMIRA, NEW YORK
VALVES • PIPE FITTINGS • FIRE HYDRANTS

OFFICE-WAREHOUSES IN NEW YORK, CHICAGO, SAN FRANCISCO • SALES REPRESENTATIVES IN PRINCIPAL CITIES

ACRES OF DOLOMITE



Looming large in their potentialities for chemical utilization are Oklahoma's huge deposits of dolomite. In Murray County, in the Arbuckle Mountains, (south central part of the state) one deposit alone covers 1400 acres with a thickness of 550 feet. Its quality is very high.

Other deposits are available elsewhere in the Arbuckle Mountains, and in the Wichita Mountain area (near Lawton).

REPRESENTATIVE ANALYSIS OF OKLAHOMA HIGH-GRADE DOLOMITE
(Analyzed by Oklahoma Geological Survey)
ROYER DOLOMITE—MURRAY COUNTY
Representing 230 Feet Thickness

	Percent		Percent
CaO	30.680	Al_2O_3	0.170
MgO	21.250	P_2O_5	0.005
K_2O	0.053	S	0.010
Na_2O	0.028	H_2O @ 105°	0.050
SiO_2	0.300	Ignition loss	47.340
Fe_2O_3	0.150		
Total oxides	100.036		

Detailed information on Oklahoma's mineral resources is available on request, based on data by the Oklahoma Geological Survey. Map showing location of mineral deposits is also available.

IN THE SOUTHWEST
YOU CAN DO BUSINESS BETTER FROM THE CENTER

OKLAHOMA

PLANNING and RESOURCES BOARD
STATE CAPITOL BUILDING
OKLAHOMA CITY, OKLAHOMA

NAMES IN THE NEWS, cont. . .

Baumann has been appointed sales manager of silicone products.

Nicol H. Smith has been appointed director of research operations of the Franklin Institute laboratories for research and development.

Arthur F. Bixby has been named manager of sales of the agricultural chemicals division of the Pennsylvania Salt Mfg. Co., Philadelphia.

Gordon W. Lindskog has been named manager of the New York office for Fritz W. Glitsch & Sons, Inc., Dallas, Tex.

Frank W. Larabee has been appointed sales coordinator on caustic soda and other alkalis between branch sales offices and executive sales offices of Dow Chemical Co., Midland, Mich.

Howard A. Jones has been appointed assistant director of laboratories of U. S. Industrial Chemicals, Inc., New York. He will be located at the company's laboratories in Baltimore.

H. A. Jones

E. F. Riter

Earl F. Riter has been named administrative assistant to the vice president in charge of the soya products division in Chicago of the Glidden Co., Cleveland. He was formerly assistant general superintendent of the paint and varnish division.

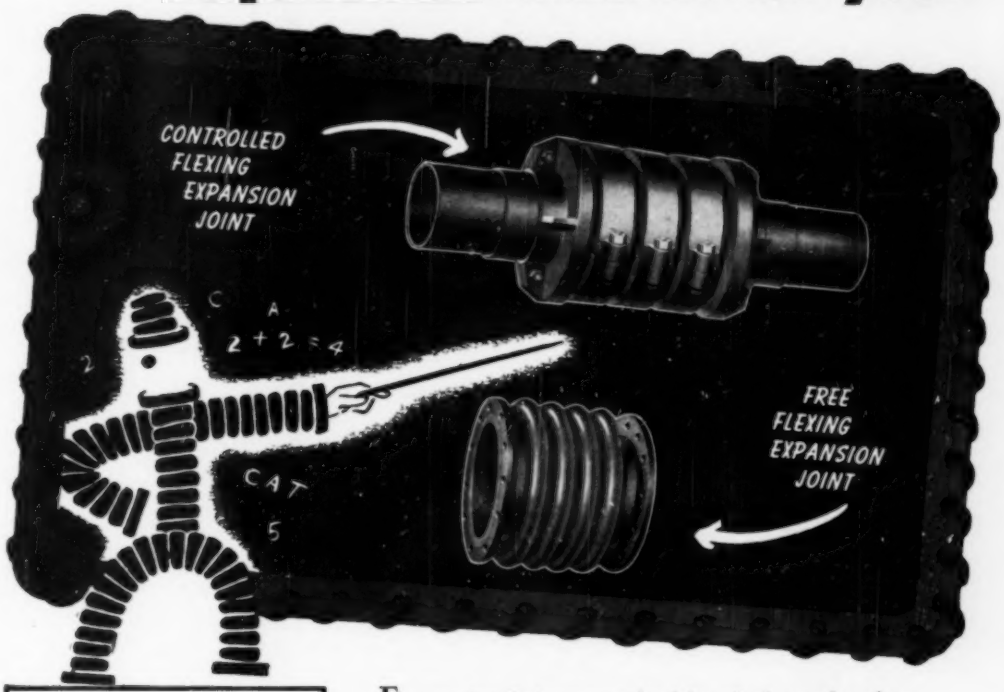
Horace Wood, Jr. has been appointed a sales development representative of the surface coatings department of Monsanto Chemical Co.'s Merrimac division.

Lloyd K. Wells has been made manager of the southern division of Graver Construction Co. with headquarters at Houston, Tex.

William L. McKnight has been elected chairman of the board of Minnesota Mining & Mfg. Co., St. Paul, Minn. **Richard P. Carlton** succeeds him as president of the firm. **Archibald G. Bush** becomes

(Continued)

Let CMH simplify expansion control for you



CMH FREE-FLEXING EXPANSION JOINTS for pressures to 30 psi.; temperatures to 1400° F. Sizes to 24" I.D. Flanged or welding ends.

CMH CONTROLLED-FLEXING EXPANSION JOINTS with precision mated control rings for pressures to 300 psi.; temperatures to 1400° F. Sizes to 24" I.D. Flanged or welding ends.

SPECIAL CMH EXPANSION JOINTS for higher pressures can be furnished. Recommendations will be made on receipt of installation details.

For most installations, expansion joint selection need not be a complicated task. CMH has reduced the expansion joint selection problem to a matter of charts from which the joints necessary to meet your requirements may be selected quickly and easily. For unusual installations CMH offers its "Engineered Application Service" in which competent piping specialists will analyze your problems and make recommendations.

Whether your requirements are "run of the mine" or "one in a million" . . . for a new installation or replacement of obsolete equipment . . . CMH will make it easier for you to get the *right* expansion joint.

The charts mentioned above plus additional application data are presented in Bulletin EJ-49. Write for copy.

CMH—ONE dependable source for every flexible metal hose requirement

• CMH manufactures all standard types of flexible metal hose, both convoluted and corrugated, in a variety of metals; expansion joints for piping systems; stainless steel and brass bellows; various conduits and special assemblies of these components.

CHICAGO METAL HOSE CORPORATION
EXPANSION JOINT DIVISION

Leaders in the Science of Flexonics
MAYWOOD, ILLINOIS
Plants at Maywood, Elgin and Rock Falls, Illinois
In Canada: Canadian Metal Hose Co., Ltd., Brampton, Ontario
FLEXON . . . . . identifies CMH products which have served industry for more than 47 years.

CENTRIFUGALS

In the Roberts Fluid Drive Centrifugal and *only* in the Roberts machine are the following features to be had:

★

Standard motor with current peak less than 40% of direct-connected (special) motor drives.

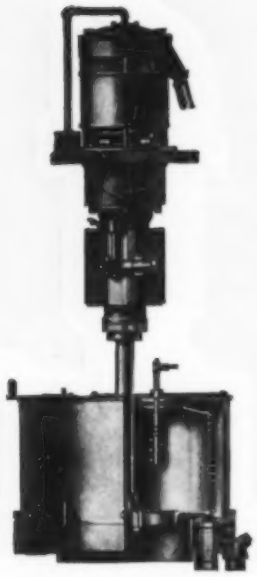
★

Uniform torque, with adjustable application.

★

Simple adjustment for accurate speed control.

★



The inherent design of our Fluid Drive machine allows special characteristics to be incorporated with ease, thus suiting it exactly to special applications. Let us show you how it can be made to work for your benefit. Send us your inquiry now . . it imposes no obligation.

ROBERTS
The
WESTERN STATES
MACHINE COMPANY
HAMILTON, OHIO, U. S. A.

NAMES IN THE NEWS, cont. . .

chairman of the executive committee.

A. M. Webb has been appointed general sales manager of the Chemical Construction Corp.

Donn R. Court has been elected vice president in charge of sales of the Cutter Laboratories, Berkeley, Calif.

Frederick Wenzel has been made works manager and **W. C. Christianson**, sales manager, of Trent Tube Co., East Troy, Wis.

William D. Jameson has been appointed pump sales manager of the Stamford division of the Yale & Towne Mfg. Co., Stamford, Conn.

Arthur E. Bald, Jr., has been appointed technical representative for the Columbia chemical division of Pittsburgh Plate Glass Co., Pittsburgh, Pa.

H. Gottwald had been appointed assistant sales manager for Nordstrom valve division, Rockwell Mfg. Co., Pittsburgh, Pa.

T. H. Cable has been made a member of the sales department, central staff of Koppers Co., Pittsburgh, Pa.

A. Myles Younger has been elected vice president in charge of sales of the Atlas Mineral Products Co., Mertztown, Pa.

Edward G. Gray has been appointed sales manager of the laminated and insulating products division, General Electric Co., Pittsfield, Mass.

Willard M. Pearson has been named manager of sales, Bond Crown and Cork Co., Wilmington, Del.

Joseph S. Crowe has been made manager of the newly-established bulk products sales department of Procter & Gamble Co., Cincinnati.

Russell M. Pickens has been elected vice president in charge of sales of Rayonier Inc., New York.

Joe Miller has been appointed to a newly-created position as coordinator of supply and sales of light hydrocarbons for Humble Oil & Refining Co., Houston.

Earl H. Cone, Jr., has been named sales manager for the newly combined industrial chemicals division and dairy products division for Her-

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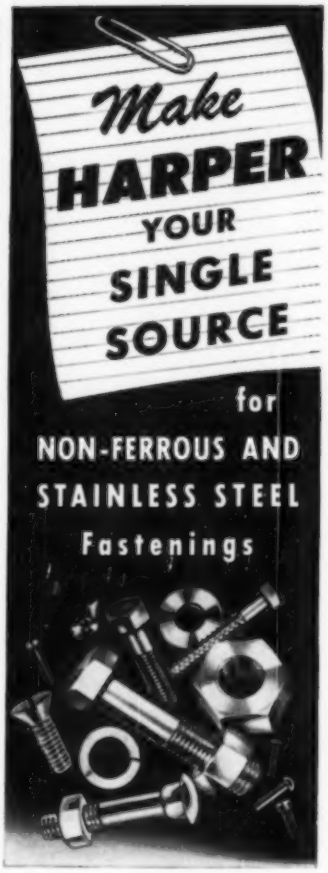


BRASS • BRONZES • COPPER • MONEL • STAINLESS STEEL

Only HARPER carries large stocks of **6,000 DIFFERENT ITEMS** in from **3 to 10 DIFFERENT METALS!**—the widest assortment of bolts, nuts, screws, washers, rivets and accessories **available from ONE SOURCE.**

Convenient Warehouse Service for prompt delivery to any point in the country.

Wire or phone your requirements to the nearest Branch Office. Complete 134-page color catalog sent upon request.

THE H. M. HARPER COMPANY
General Offices and Plant: Morton Grove, Illinois
(Suburb of Chicago)

New York Office and Warehouse: 200 Hudson Street, New York 13; **Los Angeles Office and Warehouse:** 835 E. 31st Street, Los Angeles 11. **Branch Offices:** Atlanta, Cambridge, Cincinnati, Cleveland, Dallas, Denver, Detroit, Grand Rapids, Milwaukee, Oakland, Philadelphia, Pittsburgh, St. Louis, Seattle, Toronto (Canada).

HARPER
EVERLASTING FASTENINGS

AT LAST! 6-Point Recording on a Single Round Chart

THE NEW MULTI-RECORD DYNALOG*

Employing only one measuring system, the new Foxboro Multi-Record Dynalog gives up to 6 clean-cut records in as many different colors on one convenient *round* chart. The ingenious, foolproof switching arrangement provides recordings in sequence every 6 seconds — so close that the record of each measurement appears as a continuous line. The record colors positively will not run together.

As in all Dynalog Electronic Instruments, a simple rotary capacitor is used instead of the conventional slidewire. The result is absolutely STEPLESS continuous balancing, and a combination of sensitivity, accuracy, and speed that is unequalled.

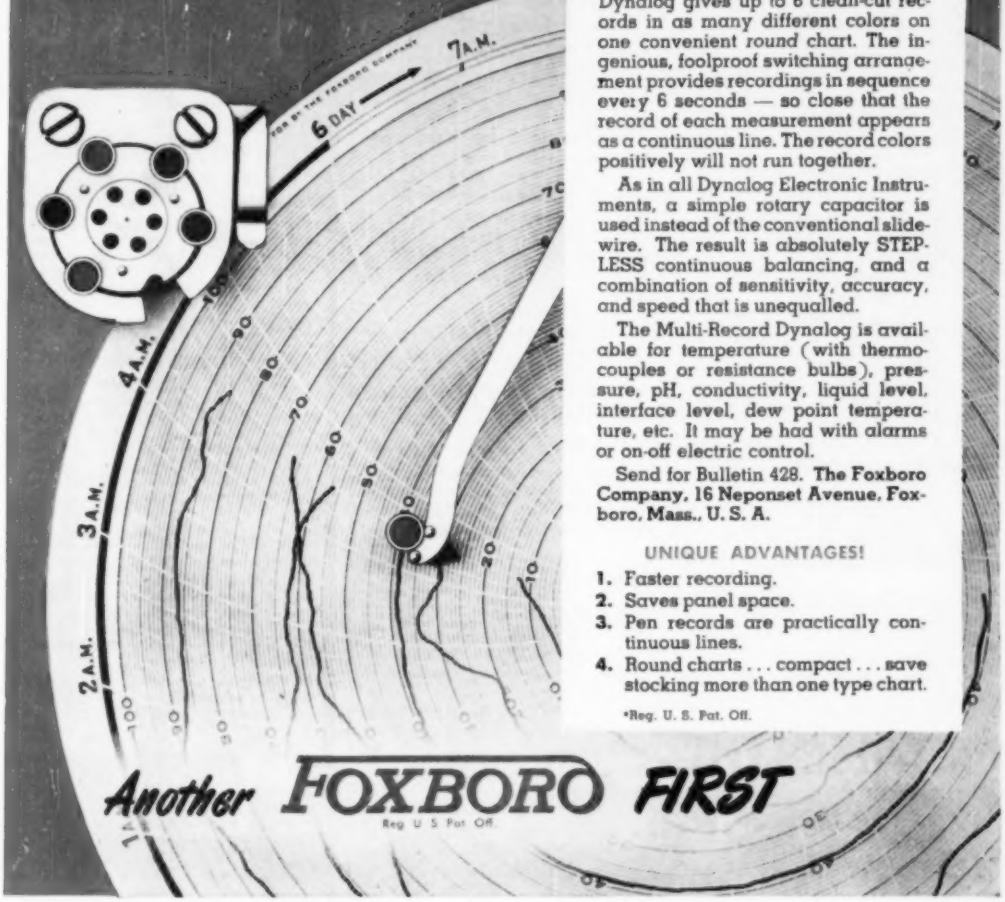
The Multi-Record Dynalog is available for temperature (with thermocouples or resistance bulbs), pressure, pH, conductivity, liquid level, interface level, dew point temperature, etc. It may be had with alarms or on-off electric control.

Send for Bulletin 428. **The Foxboro Company, 16 Neponset Avenue, Foxboro, Mass., U. S. A.**

UNIQUE ADVANTAGES!

1. Faster recording.
2. Saves panel space.
3. Pen records are practically continuous lines.
4. Round charts . . . compact . . . save stocking more than one type chart.

*Reg. U. S. Pat. Off.



Another FOXBORO FIRST

Reg U S Pat Off

SAVE MONEY—with the Extra Durability of

STAINLESS STEEL and MONEL UTENSILS by METALSMITHS

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- Illustrates complete line, with recent additions—gives descriptions and capacities.
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NAMES IN THE NEWS, cont. . .

cules Powder Co., Wilmington. **Don C. Nicholson** has been named assistant sales manager of the divisions.

Milton C. Evans has been made manager of the Columbus, Ohio, plant of Davison Chemical Corp.'s mixed fertilizer division.

John Dietze has been made sales representative in the metropolitan territory for the pigment department of American Cyanamid Co., Calco chemical division, Bound Brook, N. J.

William J. Hart has been made head of the physical chemistry section of the Institute of Textile Technology, Charlottesville, Va.

David M. Coleman has been added to the sales development department of the Hooker Electrochemical Co., Niagara Falls, N. Y.

Jesse S. Young has been made assistant to the president, supervising Eastern sales, for Advance Solvents & Chemical Corp., New York. **Charles Gardner** has been designated eastern field sales manager.

Harvey T. Kennedy has joined the staff of the petroleum engineering department of Texas A & M. He was formerly with the Gulf Research and Development Co., Pittsburgh, Pa.

A. R. Carmody has been re-elected president of the Louisiana-Arkansas division of the Mid-Continent Oil and Gas Association. He is president of the North Central Texas Oil Co.

W. J. B. Dixon has been appointed assistant to vice president (foreign) and **H. D. Teeters** has been named assistant to vice president (domestic) in Texaco organization changes.

OBITUARIES

D. Roy McCullagh, director of the biochemical laboratories of the Sterling-Winthrop Research Institute, died in Albany, N. Y., on September 17.

Walter S. Going, vice president of Continental Gin Co., died at his home in Birmingham, Ala., on September 17.

Charles L. Gabriel, director and vice president of Publicker Industries Inc., died in Philadelphia on September 24.

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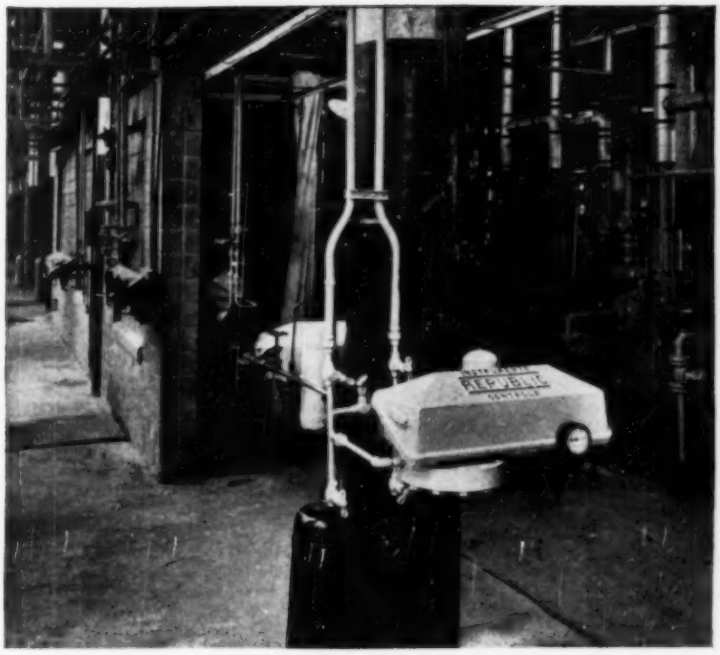

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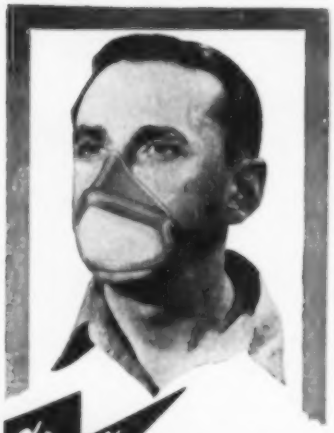

New

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No respirator does any good unless workers will wear it. Even if your men won't use old-fashioned respirators—cumbersome, grotesque, stifling—they're glad to wear the new Flex-a-Foam Filter Mask. Here's why:

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THE GOGGLE PARTS COMPANY
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INDUSTRIAL NOTES

American Liquid Gas Inc., Detroit, has changed its name to Trugas Constructors, Inc. The company has been appointed sales representative for the Posey Iron Works, Lancaster, Pa., in Michigan, Indiana and Illinois.

Onyx Oil & Chemical Co., Jersey City, N. J., has moved its New England office from Providence to Boston at 80 Federal St.

Troy Engine & Machine Co., Troy, Pa., has formed a process machinery division with the acquisition of two new lines. The company has bought out the colloid mill division of C. O. Bartlett & Snow Co., Cleveland, and the roller mill and mixer division of the Brasington Corp., Cincinnati.

L. Sonneborn Sons, Inc. has moved all divisions except building products to 300 Fourth Ave., New York 10, N. Y.

Matheson Co., East Rutherford, N. J., has merged with Royal Organic Chemical Co., Roselle, N. J. All Royal's operations will be transferred to East Rutherford.

Glidden Co., Cleveland, has established a graphic arts and sign finishes department in its paint and varnish division.

Ralph M. Westcott Co., 1700 South Main St., Los Angeles 15, Calif., has changed its name to Water Chemists, Inc.

Niagara Blower Co., New York, has been awarded the license by Research Corp., New York, to manufacture dehumidifying and air conditioning equipment under its series of patents covering the removal of moisture from air or other gases by the use of a hygroscopic liquid.

Ebasco Services Inc., New York, has opened a Chicago office at 209 South La Salle St.

Link-Belt Co., Chicago, has opened a district sales office in Duluth, Minn.

(*Continued*)

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★ **Bring new advantages** that improve your products and processing

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This new group of solvent oils have many cost-cutting properties, including: increasing the solvent power of kerosene; dissolving insecticide chemicals such as 2-4-D, DDT, etc.; cutting back tar pitches; adding to the flow of enamels; serving as a penetrating oil.

The price range of Picco HI-SOLV Solvent Oils is very attractive!

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The Versenes* are extremely versatile organic chelating agents of exceptional stability. They control metallic ions with mathematical exactitude. This control may be applied to completely deactivate pro-oxidant or other troublesome ions or to give *controlled* activation for catalytic processes.

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Framingham, Massachusetts

Chicago Agent: Kraft Chemical Co. Inc., 917 W 18th St. Chicago
West Coast Agent: Griffin Chemical Co. San Francisco-Los Angeles

INDUSTRIAL NOTES, cont. . .

John E. Morrison has been put in charge.

Research Engineering and Mfg. Co., Boston, has been formed to engage in patent investigations.

John Nooter Boiler Works Co., St. Louis, Mo., has changed its name to Nooter Corp.

Texas Co., New York, has renewed its graduate fellowship in chemical engineering at Cornell University.

Hammel-Dahl Co., Providence, has appointed Thompson Engineering Co. as a dealer for its automatic control valves in central and eastern Louisiana, southern Mississippi and northwestern Florida.

Interlake Iron Corp., Cleveland, has taken over the activities of its subsidiary, Interlake Chemical Corp. The business will be continued by its coal chemicals division.

Minnesota Mining & Mfg. Co. has moved into two new combination branch office and warehouse units. One is in Ridgefield, N. J., and the other in Grand Rapids, Mich.

Bristol Co., Waterbury, Conn., has consolidated its Akron and Chicago branch factories.

Dorr Co., New York, has acquired rights to the metallurgical jigs and sewage aerators of the Pan-American Engineering Co.

United States Foreign Corp. and **Sinex Corp.** have jointly leased the front half of the eighth floor of the Squibb Bldg. at 745 Fifth Ave., New York.

Powermatic Ventilator Co., Cleveland, has changed its name to Iron Lung Ventilator Co.

Kaiser Fleetwings, Inc., Oakland, Calif., has changed its name to Kaiser Metal Products, Inc. The company has completed a new $2 million enameling plant at Bristol, Pa.

Cooper Alloy Foundry Co., Hillside, N. J. has appointed Wm. G. Boales & Associates, Detroit, as its Michigan representative.

Flexitallic Gasket Co., Camden, N. J., has appointed Power Engineering and Equipment Co. to represent it in southern California. Northern California will be served by Trans-

mission Engineering Co., San Francisco.

Kieley & Mueller, Inc., North Bergen, N. J., has appointed three new West Coast sales representatives. They are: W. J. Beckett Co. in southern California; Hugh Rodman, in northern California; and Farnes & Martig, Inc., in the Northwest.

Parker Appliance Co., Cleveland, has appointed Metal Goods Corp., Dallas, Tex., as distributor for O-rings.

Pittsburgh Coke & Chemical Co. has appointed S. D. Day Co., Houston, Tex., as southwest representative for its protective coatings.

C. J. Tagliabue Corp., Newark, N. J., has appointed the following sales representatives: E. A. Thornwell, Inc., Atlanta; Ranson, Wallace & Co., Charlotte; Ambos-Jones Co., Cleveland; Butler and Land, Dallas; Lynn Elliott Co., Houston; Curtis H. Stout, Little Rock.

J. M. Huber Corp., New York, has appointed the Edward J. Lewis Co., Chicago, as its district representative.

Globe Steel Tubes Co., Milwaukee, Wis., has appointed the John A. Rhodes Co., Springfield, Mo., as its distributor of fittings and flanges.

Link-Belt Co., Chicago, has opened a new manufacturing plant in Houston, Tex.

Process Industries Engineers, Inc., Pittsburgh, Pa., has been appointed as sales engineering representative for Gast Mfg. Corp, Benton Harbor, Mich.

Baxter Laboratories, Inc., of Morton Grove, Ill., manufacturers of intravenous solutions and administrative sets will locate a plant at Cleveland, Miss.

Merck & Co., Inc., has transferred its St. Louis, Mo., branch from 4528 Broadway to new and larger quarters at 4545 Oleatha Ave. The move, made necessary by Merck's increased business in the Midwest and Southwest, provides the branch with expanded office and warehouse facilities and improved rail and truck transportation service. New buildings, completed recently, provide 61,000 sq. ft. of floor space.

United Gas Pipe Line Co. plans to build a new research laboratory near Shreveport, La., at a cost of 325,000. —*End*

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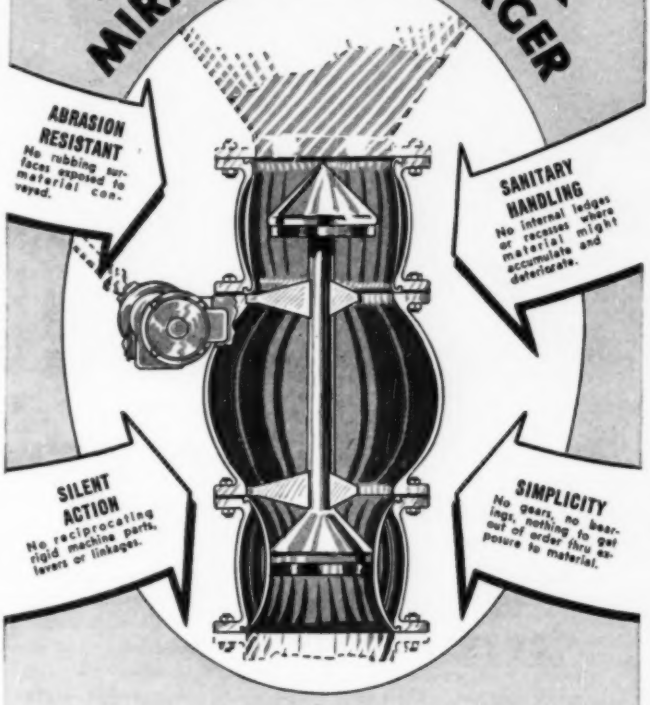
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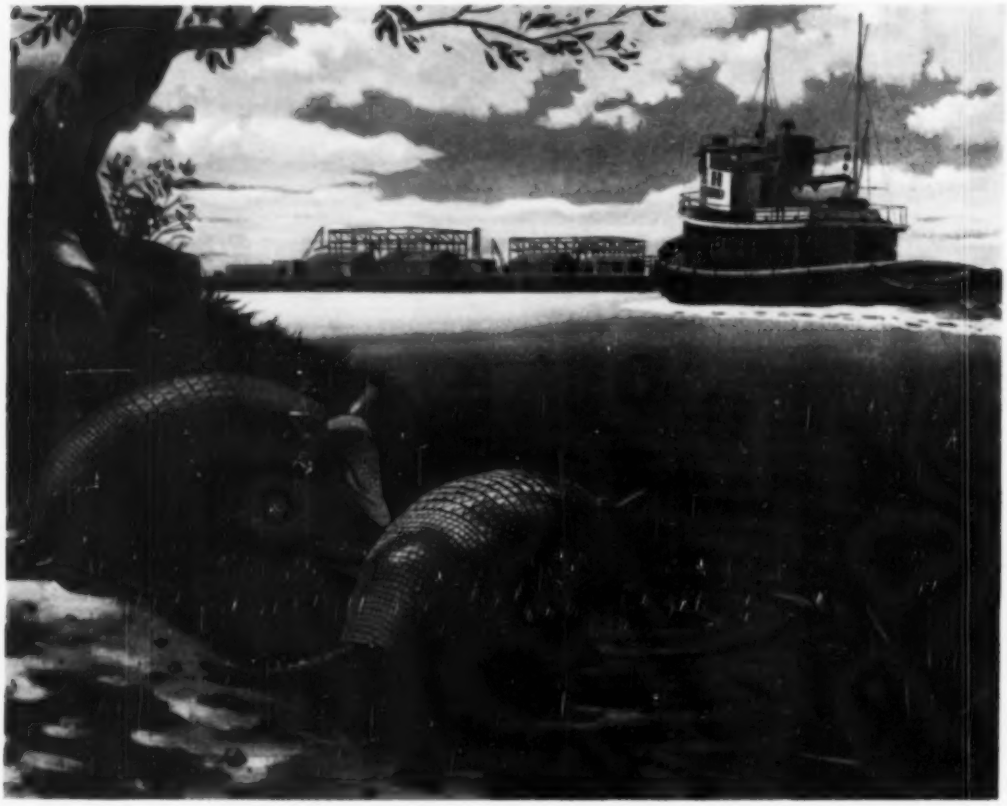

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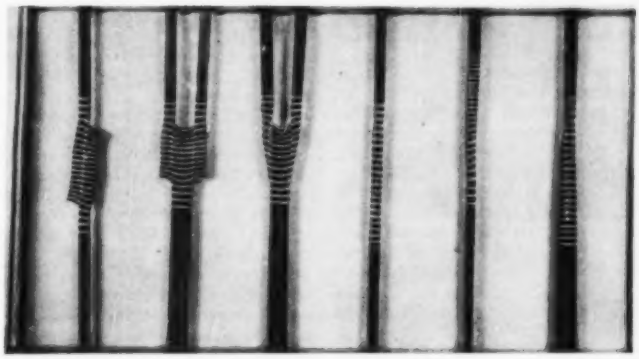
Quotes, Extracts and Digests

LESTER B. POPE, *Associate Editor*

UNSTRETCHED



STRETCHED

Distribution of stresses in shear test specimens. These examples of stress concentrations in joints illustrate what happens at the bonds in the case of adhesives and adherends of different stress-strain characteristics. (The two specimens at the right are materials of unequal modulus.) If the two materials are of equal modulus, the single scarf joint is adequate to produce uniform stress conditions. With unequal moduli, use double scarf joints with angle taper proportional to moduli.

Fundamentals of Adhesion

G. M. KLINE & F. W. REINHART

Most significant factor in adhesion is the molecular attraction operative between the adherend and the adhesive. There are many physical factors which affect the strength of a bond by determining the closeness of contact of the adherend and adhesive, by altering the surface area involved, or by influencing the stress conditions in the joint either as initially formed or under external loading. Although some of the strength of a bond between an adhesive and a porous surface can be attributed to tendrils of adhesive which enter the pores, this mechanical interpenetration can not account for more than a small fraction of the joint strength. Evidence has accumulated from many pertinent fields which indicates that molecular attractive forces are primarily responsible for the bond between any two surfaces.

CHEMICAL FACTORS

In considering the chemical and physical phenomena involved in adhesion and cohesion, four general types of chemical bonds must be recognized: electrostatic, covalent, and metallic which are referred to as primary valence bonds, and residual bonding attraction forces, commonly known as van der Waals forces, which are referred to as secondary valence bonds.

Electrostatic or polar bonds are the type which act to hold together the atoms in common salts. Covalent bonds are the type which act to hold together the atoms of carbon, hydrogen, and other elements in organic compounds. It is also this type of bond which holds the atoms together in diatomic gases, such as chlorine. Metallic bonds are the type which hold the atoms of metals together.

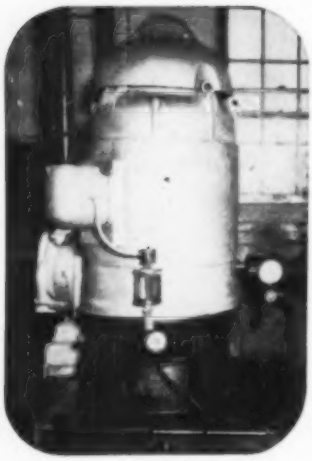
Van der Waals forces are responsible for the so-called secondary bonds between substances as contrasted with the primary bonds—electrostatic, covalent, and metallic—which are based on the potent forces of attraction between atomic nuclei and orbital electrons. When such primary bonds are formed, the positive and negative charges of the participating atoms are not completely neutralized. There remain in many molecules residual energies which are very nearly of stable bond forming magnitudes. These secondary bonding forces are of considerable significance in the adhesive behavior of complex substances.

Van der Waals forces can be attributed to three different effects: (1) the orientation effect of permanent electric dipoles, (2) the induction effect of permanent dipoles on polarizable molecules, and (3) the dispersion effect of internal electron motions independent of dipole moments.

A knowledge of the chemical nature of surfaces is necessary in order to understand the mechanism of bond formation between adhesives and adherends.

The surfaces of solids are entirely different from their internal structures. The simple treatments of grinding and polishing differ very greatly in their effects on surface nature. In metals, especially, X-ray diffraction patterns show that grinding removes sections of the surface without appreciable distortion of the remaining crystal structure, whereas polishing removes the promontories and deposits materials from them in the crevasses, leaving a smooth transparent amorphous film known as the Beilby layer. This layer has more of the characteristics

(*Continued*)



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of a liquid than a solid and is much more reactive.

The best adhesion is given by adhesives which wet the surfaces of the adherends, in other words, adhesives which have a greater adhesive attraction for the adherend surfaces than cohesive attraction within themselves. The forces governing the wetting of surfaces are the Van der Waals chemical attractions (orientation, induction, and dispersion).

PHYSICAL FACTORS

Physical factors which affect the strength of bond between an adhesive and adherend involve (1) closeness of contact, (2) surface area, and (3) stress condition.

The physical character of the surface of the adherend and the physical state of the adhesive must be such that the molecules of the two materials can be brought into close enough contact for the molecular forces to become operative.

The surface of the adherend must be clean and sound. Foreign materials on an adherend often are decisive factors in determining whether or not a particular adhesive will bond to a particular adherend.

A sound surface is one which is free of poorly bonded foreign matter but is not necessarily of the same composition as the bulk of the adherend.

The physical state of the adhesive must be such that the molecules can come into close contact with the surface of the adherend so that the molecular forces can become operative. This molecular nearness can be obtained in several ways. (1) The adhesive molecules can be synthesized in contact with the adherend as in the case of monomers which polymerize or condense to from a solid adhesive in situ. (2) A solid material can be applied as a solution in a volatile solvent. (3) A solid adhesive can be liquefied by heating. (4) A solid material can be liquefied by applied pressure, becoming solid again when the pressure is removed.

There are several methods commonly employed to increase the area of solid surface available for participating in the bonding operation. These include physical means, such as sandblasting and sandpapering, and chemical means, such as acid-etching and solvent attack.

In order to obtain a strong joint, a smooth surface is more desirable than a roughened one, inasmuch as the depressions in the latter must be filled in addition to the gap between the two surfaces. Furthermore, if the surface is deeply scored, there is always a possibility that air bubbles will be trapped in the glue line.

DON'T WORRY

"There appears to be no immediate need to create a synthetic fuel industry to satisfy the world's oil requirements."

E. V. Murphree, ***President Standard Oil Development Co.***

STRESS-STRAIN RELATIONSHIPS

Although molecular attraction is the most significant factor in adhesion, the stress-strain behavior of an adhesively bonded joint is probably the most important factor in determining its strength under service or testing conditions. Readily deformable adhesive materials such as rubber flow or yield sufficiently at ordinary temperatures to avoid production of large residual stresses during the bonding operation. However, this type of adhesive does not produce the rigidity required for structural applications and fails at low temperatures for the same reasons that rigid adhesives fail at ordinary temperatures, namely, inability to eliminate stress concentrations by yielding with the dimensional changes of the materials bonded.

Analysis of the factors responsible for the production of stress concentrations in a rigid bond must include the following: (1) stress-strain characteristics of adherend, (2) stress-strain characteristics of adhesive, (3) dimensional changes in setting of adhesive and (4) dimensional changes under service conditions.

OTHER FACTORS

The highest bond strengths are usually observed with polymers of intermediate molecular weights. The low molecular weight materials fail in cohesion rather than adhesion. The high molecular weight materials have low bond strengths because (1) the adhesive does not flow sufficiently to make good contact with the adherend or (2) if drastic bonding conditions are used to make the adhesive flow to make contact, the adhesive becomes too rigid to relieve stresses developed on returning to room conditions, thus lowering the bond strength.

Tack temperature is related to the flow characteristics and to the molecular weight of the polymer in question. The tack temperature is indicative of the region in which the material flows more or less readily. It is apparent that a material with a low tack temperature will have low cohesive strength and one with a high tack temperature will not have the requisite flow characteristics.

The porosity of a surface can affect

DON'T WORRY (2)

"There is every evidence that for many, many years Western Hemisphere crude oil production will continue to be adequate for Western Hemisphere requirements. We are not running out of oil."

C. F. SMITH, *Vice President Standard Oil Co. (N. J.)*

the adhesive in many ways. If the liquid adhesive flows into the pores and solidifies so that the surfaces of the projections maintain contact with surfaces of the pores, an increase in adhesion will be observed. The major part of any increased strength is attributed to the increase in area of contact.

Pores may also cause the bond strength to decrease. First, a porous surface is harder to clean. Second, porous surfaces are often not sound. Third, it is more difficult for the adhesive to wet the surface. Fourth, gases may be trapped in the pores hindering contact.

It is sometimes desired to bond materials together for which no suitable common adhesive is available and which do not bond to each other. A prime coat is often applied on one or both of the materials in such cases. The primer in this instance is an intermediate adhesive between the adherend and the adhesive proper. The principles which apply to adhesion apply also to these prime coats or primers.

G. M. Kline, and F. W. Reinhart, National Bureau of Standards, before the Wood Industries Conference of the American Society of Mechanical Engineers, Jamestown, N. Y., Sept. 27, 1949.

STEEL

. . . Freedom and Responsibility

Charles Sawyer

We continually face, in a discussion of our economic and social problems, the need to define the line which marks the limits of governmental assistance or action. You have heard occasionally of theories regarding goals of production and possible capacity for industry, including the steel industry. My own belief is that the normal desire of businessmen to make a profit will operate to increase capacity where it is needed. If, however, because a business operation was not profitable or for any other reason critical materials needed in industry could not be secured through the activities of private enterprise, I would certainly not sit by and see

(Continued)

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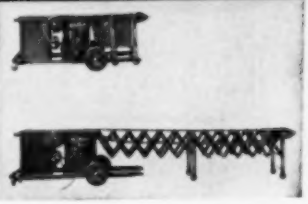
THE Standard E-X-T-E-N-D-O-V-E-Y-O-R PORTABLE POWER-BELT CONVEYOR



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This compact, mobile, easily maneuverable power-belt conveyor unit extends to 46" in either direction and retracts to 9'10". Reaches into cars, trucks, trailers. Handles boxes, bags, bundles, cartons, crates, cases weighing up to 150 lbs. Available in two models — 1 way stretch and 2 way stretch — and 4 sizes. Write for Extendoveyor Bulletin No. CM-119.

STANDARD CONVEYOR CO.
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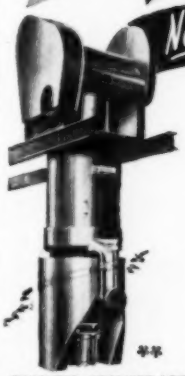
J&C*

Zenith Continuous Pulp Presses Now Available in 2 Models

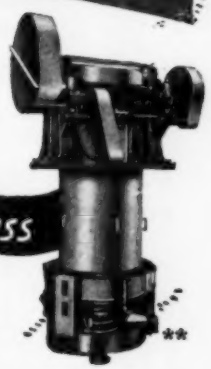
New ZM Press

The ZM Continuous Pulp Press is the answer to the demand for a press of smaller capacity, but retaining the high efficiency and all of the outstanding features of the parent press.



ZL Press

Zenith* Model ZL Pulp Presses are being used for dewatering, beet pulp, pineapple, tomato pomace, corn germ and fibre, vegetables, brewers grain, cherries, citrus fruits, fish, paper pulp, and many other materials, assuring a direct cake of uniform consistency.



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100% continuous . . . from storage bin to pressed cake, the ZL Press dewaters *up to 26 tons of wet pulp per hour.*

Model ZP . . . our smallest press with less capacity than the ZM or ZL but having a very high efficiency.

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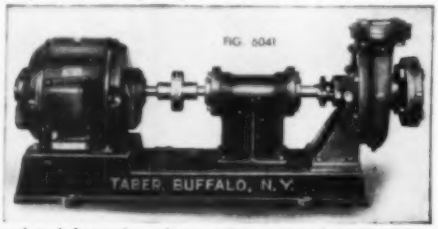

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QED, *cont. . .*

our economy disintegrate because the government believed it was helpless and unable to save its people from disaster. Furthermore, if our industrial machine is grinding to a halt because of a stubborn and unreasonable refusal of steel men to produce what the economy demands, I would be willing to support drastic measures to prevent that result. I see no reason to feel that such an occasion will arise. The steel industry has produced far beyond the dreams of any economist two years ago.

Business activities in any event should be left to business. However, business must appreciate the responsibility which it carries. All businessmen carry a major portion of the responsibility for seeing that our capitalistic system contributes at all times towards helping all men to enjoy a better way of life. Capitalism cannot attain lasting success if it benefits a few as distinguished from the many.

Government and steel industry cooperation in the past has been an outstanding success. The steel industry can rightfully be proud of the part that it has played.

Charles Sawyer, Secretary of Commerce, before American Iron and Steel Institute, New York, May 26, 1949.

FERTILIZERS

. . . Nitrogen Warning

H. A. Curtis

Nitrogenous fertilizers now are used in far greater quantities than ever before throughout the world. Although this situation is a fortunate one during the present period of food shortages as an aftermath of war, the situation is by no means a happy one from the long-range viewpoint of soil conservation. The liberal use of nitrogenous fertilizers does not build up a reserve of mineral nutrients in the soil; rather it stimulates crop growth and effects a "mining of the soil," a process which already has made deserts of great areas of once rich agricultural land and which goes on apace. Obviously, there will always be the need for additive nitrogen in the growing of some crops, but the chief de-

YES, BUT

"Fluorine in the air damages crops, poisons livestock and blurs window panes, but it does no lasting damage to the soil."

W. H. MacIntire
University of Tennessee

pendence for soil nitrogen in the production of general crops and pastures should rest upon the nitrogen-fixing bacteria in the soil.

From the standpoint of conservation of natural resources, the production of cheap nitrogenous fertilizers is primarily a temporary blessing, one that might eventuate into a menace to the maintenance of soil fertility which is the greatest of natural resources. This possible menace lends emphasis to the importance of phosphate and potash and the need for their wise use and conservation.

H. A. Curtis, Tennessee Valley Authority, before the United Nations Scientific Conference on the Conservation and Utilization of Resources, Lake Success, Aug. 26, 1949.

CHEMICAL EXPANSION

. . . *Non-Chemical Industries*

Raymond Stevens

Where does the chemical industry end? Even to the layman, many industries are now classified as chemical that once would have seemed remote from chemistry. Manufacturers of drugs, explosives, fertilizers, glass, metal alloys, paints, paper, petroleum products, photographic materials, plastics, rayon, rubber, vegetable oils, and soaps are among those who use chemicals or chemical processes and are in the chemical field. At one time many of these would not have been termed chemical.

In some cases the transition has been so fast that industries originally mechanical or physical are now listed as chemical. In others, as in housing, the impact of chemistry has altered its character to a lesser but nevertheless significant degree. In the building industry, for example, the postwar demand for inexpensive housing has emphasized the chemical nature of wood and wood products. Chemists working on materials important to it are advancing other industries as in plastics and branches of metallurgy, and are creating new businesses as in the relatively new industrial field of silicon chemistry. These same chemists within an organization constitute a liaison with the scientific world.

Even newer opportunities for chemistry and the methods of chemical engineering appear. Industry has been learning more about chemistry, and chemists more about industry; and the discoveries of each are providing new materials and new tools for both.

The food we eat and the way we prepare it, the houses in which we live and the way we live in them, are

(Continued)

Smooth, uninterrupted flow is assured in any piping system using *FLOWLINE* stainless steel welding fittings because:
(1) The interior walls of each fitting are free from scores, scratches, die marks, waves, or ridges.
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FLOWLINE fittings are available in Stainless Types 304, 316, and 347—to match pipe and tubing of various wall thicknesses in sizes from ¼" through 12".

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Reclaim Lubricating Oil

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An efficient process for clarifying used lubricating oil specifies our B-W Silicate of Soda. The detergent action of B-W, which has an alkali to silica ratio of 1:1.6, wets the burned carbon particles so that they settle leaving clear oil to be drawn off for distillation. The ability to wet grease and dirt is a valuable property of the soluble silicates.

Insoluble Silicate Paints

USE-FILE #27-1

Insoluble coatings made with PQ Silicates are produced by baking at high temperature for a few minutes and slowly cooling. Our Kasil No. 1 Potassium Silicate mixed with such pigments as titania, iron, or chromic oxide yields very satisfactory results. Coverage is 500 square feet per gallon (dilute Kasil with 1/3 water and add 3 lbs. pigment per gallon).

SILICATE P's & Q's

For more information on these silicate uses write for the above file numbers.

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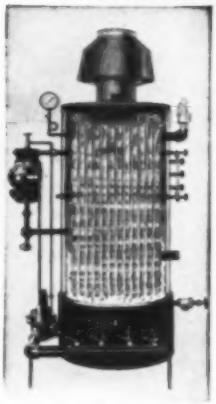

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QED, *cont. . .*

due in a surprising measure to chemistry. One may claim indeed that chemistry is moving into and far beyond non-chemical industries—even to our national and international life.

Raymond Stevens, Arthur D. Little Inc., before the American Institute of Chemists, Chicago, Ill., May 7, 1949.

HIGHER EDUCATION

. . . *Help From Business*

Frank C. Hockema

American colleges today are facing a financial crisis. An estimated 2,400,000 students registered this year to study in an educational plant built to serve a maximum of 1,600,000. Attendance by 1950 is expected to approach the three million mark. What makes these figures spell bad news financially for colleges is the fact that tuition costs supply only part of total bill. Approximately 40 percent of every student's educational expense must be borne by the college from endowments, loans, gifts and other sources. These have not been proving adequate, with the result that many universities are getting further and further into the red.

In addition to this, devaluation of the dollar has decreased the value of teacher's salaries to the extent that much valuable talent is being forced to leave for higher paying jobs. Facilities are overcrowded, understaffed, and maintenance costs have increased at least 100 percent.

The survival of our nation depends upon the quality of our education. Everyone benefits from the right kind of educational system, and employers particularly. The stake that industry and business have in education is inestimable.

Besides tuition and fees, colleges normally receive aid from endowments, the community, state and federal government. Attempts are being made to expand this assistance, but there is considerable opposition from many quarters to entended federal aid. Businesses and industries have provided some financial aid in the past. Many would do much more if it were possible under state and

IS BIGNESS BAD?

"The United States sent on Lend-Lease 11 billion dollars worth of material to Russia. If the Russians had had one General Motors they would not have needed Lend-Lease."

M. E. Coyle, *Executive Vice President General Motors*

national laws. Prominent men in business have expressed a desire to help further.

There are many ways in which business may help: (1) Fellowships and grants scholarships, loans; (2) Outright and unrestricted gifts; (3) Services to professors such as employment as consultants, during the summer months, and through teaching fellowships; (4) Services to students such as on-the-job training, and summer employment; (5) Loan or gift of machinery and equipment; (6) Loan of company specialists to teach research, production, personnel and administrative subjects.

Colleges and universities welcome and appreciate a growing recognition on the part of industrialists and businessmen that a progressive educational system has been, and will always continue to be, vital to our American way of life.

Frank C. Hockema, Purdue University, before the American Society for Engineering Education, Troy, N. Y., June 22, 1949.

STREAM POLLUTION

. . . Common Sense

E. W. Steel

Stream pollution by sewage and industrial wastes affects cities, manufacturers, agriculturists, property owners, fish life, and recreation. Fundamental needs for correction are application of scientific knowledge already available, overcoming of legal restrictions on co-operative action and understanding of problem by public and lawmakers.

Many existing anti-pollution laws are unreasonable and ignore following important considerations:

1. A stream is an asset to a region and should be used to the best interests of that region.

2. Every stream has a self-purification capacity that it is uneconomical to disregard.

3. Wastes should not be treated to a greater extent than the self-purification capacity of a stream necessitates.

4. Sanitary engineers have sufficient knowledge of stream pollution and recovery to predict the amount of pollution a stream can care for without undesirable effects.

5. Plants for treating sewage, industrial wastes and public water supplies can be designed to fit into any scheme of stream improvement and use.

Proper organization for control is important. State anti-stream pollution boards with power to make and enforce regulations are making some progress. A recent law passed by the

(Continued)

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• Whatever your needs in pressure vessels —creosoting cylinders, bubble-towers, gas scrubbers, pressure spheres, gas storage tanks, etc. — you can depend on COLE for vessels that are *correct* in design and permanently leakproof at the welded or riveted joints. We also design and fabricate elevated tanks, acid tanks, dye vats, digestors, standpipes, storage tanks, etc. Write for latest Cole Catalog—"Tank Talk."

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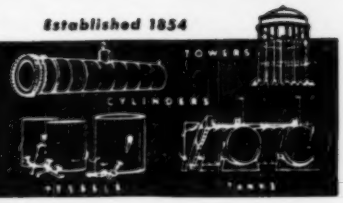

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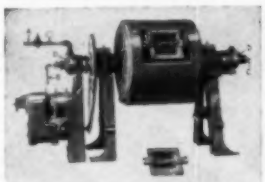
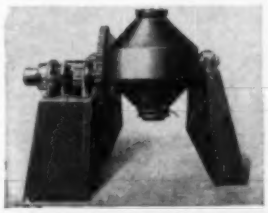
The Right Type for Every Purpose



Stainless steel jacketed Ball mill with dustproof discharge housing.

Pebble Mill with variable speed drive; jacketed for heating and operation under vacuum.



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Jar Rolling Machine for porcelain or metal jars of assorted sizes, easily removable.

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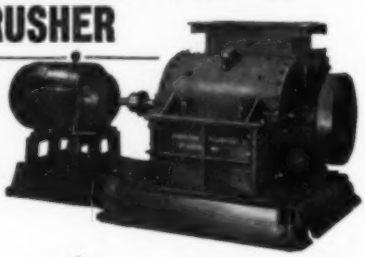
ASSURE UNIFORM REDUCTION *plus* HIGH TONNAGE with an AMERICAN CRUSHER

There's no need to sacrifice control of uniformity to gain high tonnage reduction of your materials. Efficient American Type 24 Crusher reduces all hardness of fibrous and friable materials quickly and uniformly, to assure dependable, high tonnage production—at low cost. Easy, external adjustments give a flexibility to accommodate a wide variety of materials —and a wide range of sizing.

The rugged, balanced American rotor can be equipped with rolling rings or shredder rings—or rotor can be supplied for any of three hammer types—to give you the flexibility and exact reducing action you require.



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American PULVERIZER COMPANY
Originators and Manufacturers of Ring Crushers and Pulverizers
1219 Macklind Ave.
St. Louis 10, Mo.

QED, *cont. . .*

United States Congress should encourage further improvement. Boards which have authority over a whole river basin are desirable in densely populated industrial regions.

Although stream pollution has been discussed, denounced, and legislated against for many years, pollution has steadily increased, at least in the United States.

Ernest W. Steel, Instituto Nacional de Obras Sanitarias, before the United Nations Scientific Conference on the Conservation and Utilization of Resources, Lake Success, Aug. 22, 1949.

PETROLEUM

. . . *Hydrogenation*

B. Holroyd

All processes which have as a primary object the production of petrol or other fuels from materials of different molecular weight fall naturally into two main groups.

1. Processes which build up the required product from lower molecular weight materials, i.e., polymerization processes of various sorts, alkylation, Fischer Tropsch, etc.

2. Processes which obtain the required product by breaking down larger molecules, i.e., cracking and destructive hydrogenation.

In the first group the flexibility arises mainly in the process of building up since there is not much room for variation in the low boiling olefines and iso paraffins, $CO + H_2$ mixtures etc. which are used.

In the second group, however, there is a wider choice of both starting materials and of products.

Large scale experience of the hydrogenation process has shown that the range of raw materials which can be successfully treated includes bituminous and brown coals, tars, pitch, petroleum residues, gas oils, naphthas etc.

The control of products which hydrogenation allows is two fold. First, it is possible to obtain a desired product in high yield with an absence of material of higher molecular weight

PAPER PER CAPITA

"Paper consumption in the United States was 350 lb. per capita as compared with ½ lb. per person in China where the art of paper making originated centuries ago. Yet China has as many people employed making paper as does the United States."

K. D. Lozier, *Vice President St. Regis Sales Corp.*

than the feed stock and a comparatively small yield of byproducts. Thus the hydrogenation of coal can give fuel oil as one of its main products, or the stages of hydrogenation can be carried so far as to give a high volatility petrol as the only liquid product. The ability to recycle unconverted material is an important feature. Second, the choice of conditions of temperature, pressure and catalyst affords an important means of controlling the nature of the hydrocarbons which are found in the final product. Thus by hydrogenation of coal or coal products, highly aromatic petrols can be made or, alternatively, petrols with very low aromatics but richer in naphthenes and paraffins.

R. Holroyd, Imperial Chemical Industries, before the United Nations Scientific Conference on the Conservation and Utilization of Resources, Lake Success, Aug. 29, 1949.

METALLURGY

. . . *Titanium*

Karl T. Compton

Government research projects are delving deeply, and to the tune of millions of dollars, into metallurgical research. Military purposes demand heat resistant materials for jet engines, corrosive resistant metals to protect equipment, and a comprehensive study of the stresses and mechanical behavior of steel and other metals. Not the least of the programs being developed is that involving the study of methods of production of titanium.

This mineral, about twice as strong as iron and six times as strong as aluminum, yet having a density two-thirds of that of iron, holds its strength characteristics at unusually high temperatures. Although we are not yet able to produce the metal and its alloys economically, the solution to the problem is within sight.

In the development of aircraft, and particularly of guided missiles, where speeds many times the speed of sound are contemplated, titanium-base alloys will become invaluable not only because of their strength and thermal endurance, but also on account of their inherent resistance to corrosion. Although there is much research yet to be done, it is not impossible that titanium-base alloys, once easy to obtain, will be useful even in the design of ordinary aircraft. Furthermore, in the event of another war, guns and equipment carried by planes, if made of titanium, could greatly increase the plane's load capacity.

In addition to the titanium program, among others, aluminum, mag-

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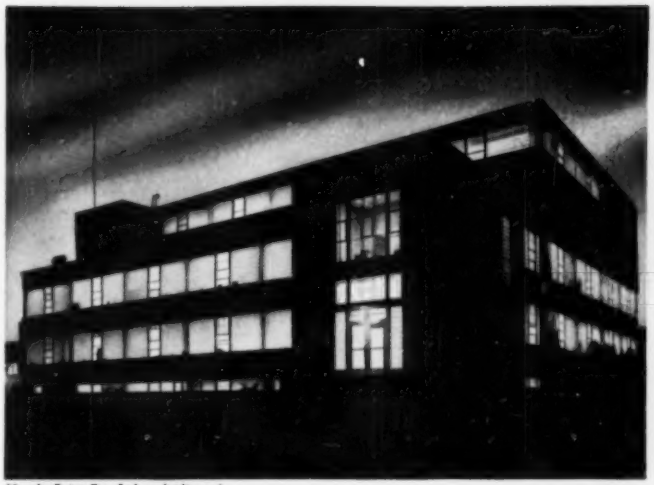

Murphy Paint Co., Ltd., subsidiary of Pittsburgh Plate Glass Co.

You can total profits NOW with INVESTMENT PROTECTION!

Here's another case history on the advantages of *"Automatic" Sprinklers* . . . further proof that profits can be totaled NOW with INVESTMENT PROTECTION. Representing a property valuation of over $1,500,000, the Toronto plant of Murphy Paint Company, Ltd., is a perfect example of modern thinking from a construction point of view. That same thinking held sway when it came to the selection of fire protective equipment for the safety of lives and the preservation of property. *"Automatic" Sprinklers*, on their record of performance, were the management's choice.

But savings are also of important concern to Murphy Paint and they report, that in their case, *"Automatic" Sprinklers* will pay for themselves through reduced insurance rates in about five years. That's INVESTMENT PROTECTION, considerably less costly than would be fire destruction. It's substantial reason why executives in all types of business are specifying *"Automatic" Sprinklers* for both old and new construction. They've made them their first line of fire defense and, ***you should too.*** *They're an important investment today . . . perhaps welcomed protection tomorrow.*

"AUTOMATIC" SPRINKLER CORPORATION OF AMERICA
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Typical "Automatic" Sprinkler protected properties include: Industrial Plants, Storage-Warehousing, Mercantiles, Piers-Wharves, Aviation Properties, Hospitals-Institutions, Hotels, Schools-Colleges, Offices, Public Buildings and many other types of occupancies.

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Thermal Insulation USE-FILE #28-S

When "G" Silicate, a hydrated powder, is heated above 200°C it puffs into tiny white bubbles of dried silica. This puffing is technically known as intumescence. The mass has high thermal and sound insulation quality. Granulated particles of such material removed from the walls of a dwelling after 20 years use were still in good condition.

Cleaning Locomotive Boilers USE-FILE #26-6

For removing gummy oil deposits from locomotive boilers (open type feed water heaters) best results are obtained with Metso Granular ($Na_2SiO_3 \cdot 5H_2O$). A solution of ½ oz. Metso per gallon of water with 0.05 oz. wetting agent is boiled under 100 lb. pressure for 20 hours. Depending on conditions, locomotives require this clean-up every 30 days.

SILICATE P's & Q's

For more information on these silicate uses write for the above file numbers.

SOLUBLE SILICATES FOR INDUSTRY

PHILADELPHIA QUARTZ CO.
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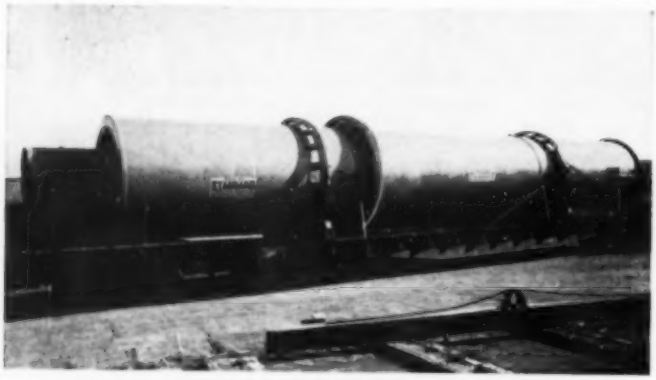

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STANDARD Rotary dryers are used throughout the world. STANDARD dryers are competently engineered and sturdily built in a wide variety of types and sizes for drying diverse products, such as chemicals, fish meal, garbage, tankage, humus, fertilizer, sewage, sludge and mineral and agricultural products. Stock designs available, sizes 2 feet to 10 feet diameters.

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QED, *cont. . .*

nesium, zirconium ceramics and steel alloys are being subjected to testing and development. In short, metallurgy, in the thinking of the military is one of the most immediately important fields of the basic physical sciences.

Karl T. Compton, Massachusetts Institute of Technology, before the American Iron and Steel Institute, New York, May 25, 1949.

PLASTICS

. . . *Finding the Market*

S. M. Ballard

There is no saturation point for plastics in the forseeable future. But how can you find the market? Here are some broad principles that may serve as thought-starters.

There are two main markets for plastics: the immediate area, and the whole United States. You should get to know every manufacturing plant in the local area; know the men and their products, and how they could use plastics. To develop the national market, plastics manufacturers should become specialists in one, or at most a few fields. Get defined exactly what you have to sell, and know your own business.

The next thing is to find out what people want or could use in the way of plastics. Helpful in this are the following points:

1. Read all the publications you can. Trade publications in your own industry are loaded with marketing ideas. National advertising in consumer magazines will tell you what products are new, and what's going over big in American business.

2. Don't overlook the yellow pages of the telephone directory; they're a gold mine of market leads. Also, study the Sears-Roebuck and Montgomery Ward catalogs; they are an excellent guide to what people want and are buying.

3. Enter into a promotional partnership with your materials manufacturer. The man who takes full advantage of all the tie-ups and promotions the materials supplier has to offer, and on top of that puts forth some effort and money himself is the one who really cashes in.

$5 GETS YOU $40

"If a farmer puts $5 worth of fertilizer on an acre of land he can expect a return of additional crops worth $40."

RAY KING, *Chairman of the Board*
National Fertilizer Association

WE'RE LAGGING

"Canada now has about 1 hp. of hydro-electric power per capita, or about five times the proportion in the United States.

HUBT MASSUE, ***Engineer Economist Shawinigan Water and Power Co.***

4. Get well acquainted with the head of your local Chamber of Commerce industrial department, and the business editor of your local paper. Get them out to your plant; explain what you do, and how and why. They get around to other industries, and are good missionaries to have.

5. Get to know local merchants, and pump them for what products or lines are selling and what might need a plastic boost. Visit expositions and shows, and ask yourself, could this be made of plastics, and can my plant make it. Local bankers too can be a help. They have a voice in an awful lot of businesses, and hand out advice that is listened to.

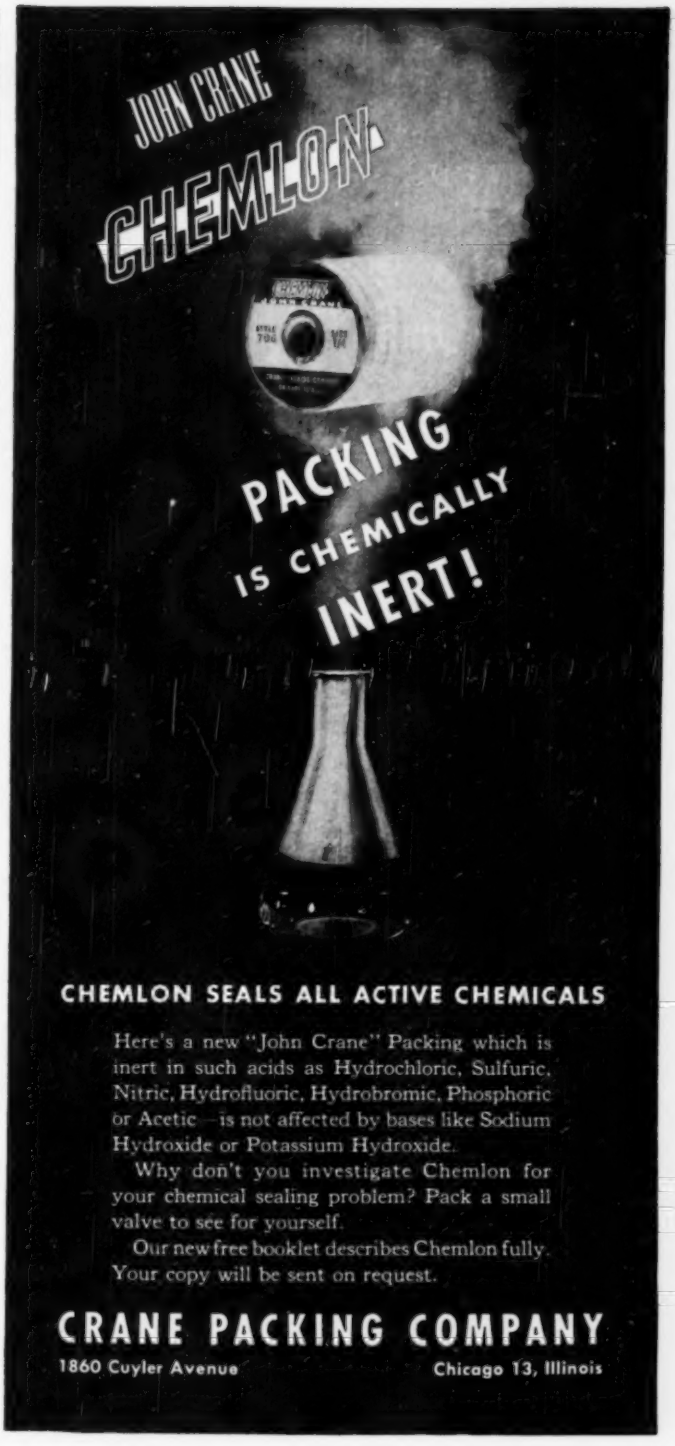
There are also a lot of selling methods that prove helpful. Never pass up the chance to merchandise any free advertising you get in the form of ads by materials manufacturers showing your product. Survey before you sell. Check a prospect's customers to find out what they like and don't like about his products. Briefed with this information, you will have no trouble in getting your prospect's ear. Don't make the mistake of invading an overcrowded field. Look at existing plastics molds elsewhere in the business before you invest a lot of your own or your customer's money in a set of molds that would have to compete sharply with established business. There are too many near-duplicate molds now, and too many fields wide open for profitable investment to continue pouring money into crowded fields.

Check upon the jobs that are lost. Why were they lost? Who got the job? Was it lost to plastics, or some other material? Getting this information is as important as making the initial bid in the first place.

Finally, remember that you're part of an industry that is going to cut an even bigger slice of the American business pie in the busy years ahead. Plastics do belong; sell them with pride and confidence. With vigorous, intelligent creative selling, there is no question about finding your markets in this, the greatest idea-buying, product-wanting, goods-consuming nation the world has ever seen.

S. M. Ballard, Gardner Advertising Co., before Society of Plastics Industry, Chicago, May 26, 1949.

—*End*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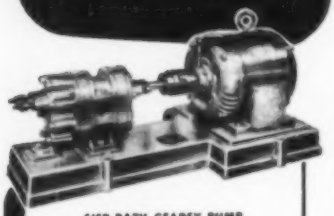
have no time
for
down-time



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Balanced axial thrust . . . pulseless flow . . . vibrationless operation . . . roller bushings for precision running under load.

Pumps: oils, varnishes, solvents, molasses, chemical solutions.

Capacities: 1-550 g.p.m.

Discharge: 250 psi for medium or high viscosities. 50 psi for water.

For higher pressures and capacities use SIER-BATH SCREW PUMPS.

A notable feature of Sier-Bath Rotary Pumps is their relative freedom from down-time for repairs and maintenance. Built in a shop equipped for manufacture of the finest precision gears, Sier-Bath Pumps show surprising ability to stand up under the most rugged operating conditions. The value of such sturdy construction cannot be over-emphasized in these days of high operating costs.

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FOREIGN LITERATURE ABSTRACTS

Depolymerization of Triisobutylene

Experiments conducted on the depolymerization of triisobutylene with aluminosilicate catalysts for catalytic cracking, at temperatures of 200, 300 and 367 deg. C. and a rate of feed of 8 to 43 mols of triisobutylene per liter of catalyst per hour, showed that the greatest yield of gas under these conditions was 2.15 mols per mol of triisobutylene passed through. The concentration of isobutylene in the gas was 96-98 percent. The relationship of the yield to time of contact τ is described in the equation:

$$\frac{dx}{d\tau} = K_o - \beta X^2$$

where x = yield of gas
τ = time of contact

In this process the triisobutylene is depolymerized to isobutylene and diisobutylene, and then the latter is depolymerized to isobutylene. In addition to the polybutenes, heptenes were also formed as primary products of depolymerization of the triisobutylene, and decenes as a result of secondary reactions of polymerization. The aluminosilicate catalyst selected for the depolymerization of triisobutylene is more active than the natural aluminosilicates, floridin and bentonite, under similar conditions.

Digest from "Conversion of Olefin Hydrocarbons in the Presence of Metallosilicate Catalysts: II. Depolymerization of Triisobutylene in the Presence of Aluminosilicate Catalysts" by R. D. Obolentsev, *Zhurnal Prikladnoi Khimii* XXII, No. 2, p. 157-171, 1949. (Published in Russia.)

Gas Elimination From Air

Air purification in industrial buildings is characterized by: the rapid rate and large volume of air as compared with the rates and volumes of gaseous mixtures which are being separated for the usual technological purposes; the velocity of air in ventilation flues attains 5-10 m. per sec. The concentration of gaseous mixtures in the air is usually much less than the concentration of the gas being separated from a gaseous mixture for technological purposes. The degree of purification of air for hygienic purposes must be much greater than the degree of puri-

(Continued)

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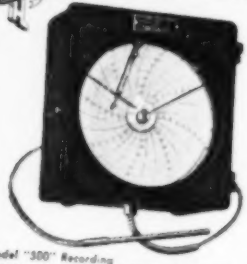
FOR TEMPERATURE RECORDING



The low-priced Recorder shown here is precision-engineered for accuracy. Liquid-filled movement is responsive to changes throughout the temperature range. Legible 6" chart with wide selection of chart ranges between minus 40°F. and plus 550°F. Choice of 24 hr. or 7 day movement. Send for catalog showing this and many other types of Auto-Lite Thermometers.

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R-S valvEvents

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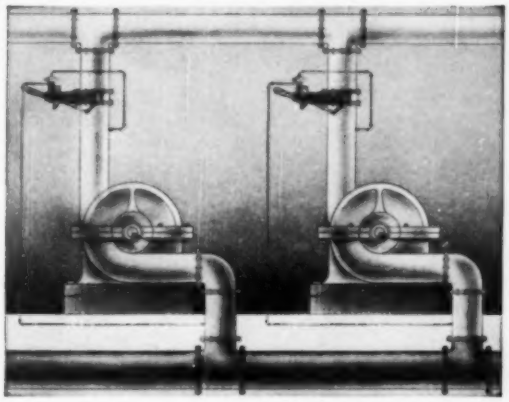


PROTECT PUMPING UNITS

The hydraulic cylinder controls in the above illustration of synchronous driven pumps are applied to R-S 125-pound Valves. If we assume 55 psi in the common header and a 2-pound lift, the cylinder positioners are set for 56 pounds. The valves will remain open as long as the differential remains above 56 pounds.

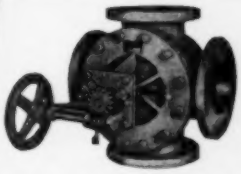
In the event of pump or power failure the natural reaction is for the flow to reverse itself through the pump. However, the drop in differential pressure causes the cylinders to close the valves and prevent reverse flow. Waterhammer is prevented because the valves close only as fast as the bleeding of the cylinder discharge. Similarly, when the motors are started the gradual opening of the valve vanes as pressure differential is regained prevents the pumps from developing an intolerable overload before full power is required.

Such automatic applications of R-S Valves are sensitive, simple and free from trouble. They definitely protect pumping units, prevent water hammer and reverse flow.

Consult with your local R-S representative. Look for the address and phone number listed under "R-S Products, Valves" or write direct.

R-S PRODUCTS CORPORATION
Wayne Junction • Philadelphia 44, Pa.

No. 731 60-inch R-S 30-pound Valve with 5-inch x 20-inch air cylinder positioner. Cylinder utilizes up to 100 psig operating air pressure. Positioner utilizes zero to 15 psig instrument air.



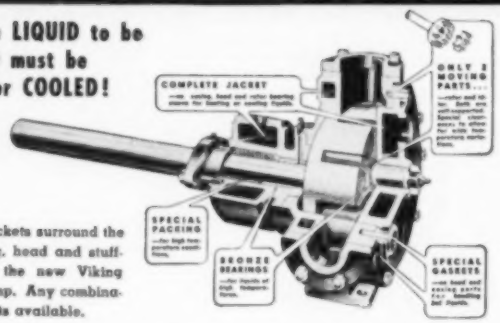
No. 648 8-inch R-S 125-pound 4-way Valve with heavy duty handwheel control and self-locking worm and gear. Widely used in lube-oil plants where sub-zero temperatures tend to freeze the ordinary 4-way valve and hinder its operation.

No. 752 20-inch x 12-inch R-S 150-pound Steel Off-center Relief Valve. The valve is pushed open by the diaphragm top and is closed by counter weights. Note positioner, handjack and exit cone on downstream side.

No. 641 14-inch R-S 600-pound Stainless Steel Valve with double-end shaft and dual finned stuffing boxes for elevated temperatures. Dual mounting brackets for mounting prime movers on either side of valve.

USE THE NEW VIKING JACKETED PUMPS

When the LIQUID to be HANDLED must be HEATED or COOLED!



Complete jackets surround the pump casing, head and stuffing box of the new Viking Jacketed pump. Any combination of jackets available.

Special bearings, packing and gaskets are standard equipment for handling hot liquids.

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Pumps available in 90, 200, 300 and 450 gpm sizes. Jacketed heads available for pumps of smaller size. Ask for free bulletin 901C today for complete specifications.

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Viking PUMP COMPANY Cedar Falls, Iowa

FILTER UNITS built by MULTI-METAL

When you submit your prints to Multi-Metal, specifications are followed to the letter. Complete stocks of filter cloth wire are carried right on the premises. We design and fabricate entire filter units and assemble right in the plant. An example of specialized filter work is shown here. All stainless steel unit features a demountable filter leaf designed for a horizontal pressure filter. This is typical of the variety of practical uses to which Multi-Metal filter units are put. Write for free sample filter swatches on your next assignment.

More than 35 years of service to process industries

Multi-Metal WIRE CLOTH COMPANY, INC. 1350 Garrison Ave., New York 59, N. Y.

fication required under technological conditions. Most methods of gas purification are based on absorption of the impurities by solids or liquids. Use of solid sorbents (such as active carbon, silica gel) or solid chemical absorbents (alkalis) is impractical where the rate of the air current is several meters per second. Some harmful gases can be treated with certain gaseous substances which will combine with them almost instantly to produce solid substances which can be removed from the air by filtration, sedimentation or other methods. Air can be purified from acid gases by passing it through a space irrigated with weak ammonia water. In cases where harmless solids are formed, the air can be purified without removing it from the building. Acid gases can be removed by various methods, such as blowing air mixed with ammonia on the source of the acid gases. Readily dissociating ammonia salts, such as ammonium carbonate, can be used as a source of gaseous ammonia in some cases.

Digest from "Chemical Methods for Eliminating Harmful Gases from Air" by V. G. Gurevich and K. K. Signlovskaya, *Zhurnal Prikladnoi Khimii* XXII, No. 1, p. 13-23, 1949. (Published in Russia.)

Briefs . . .

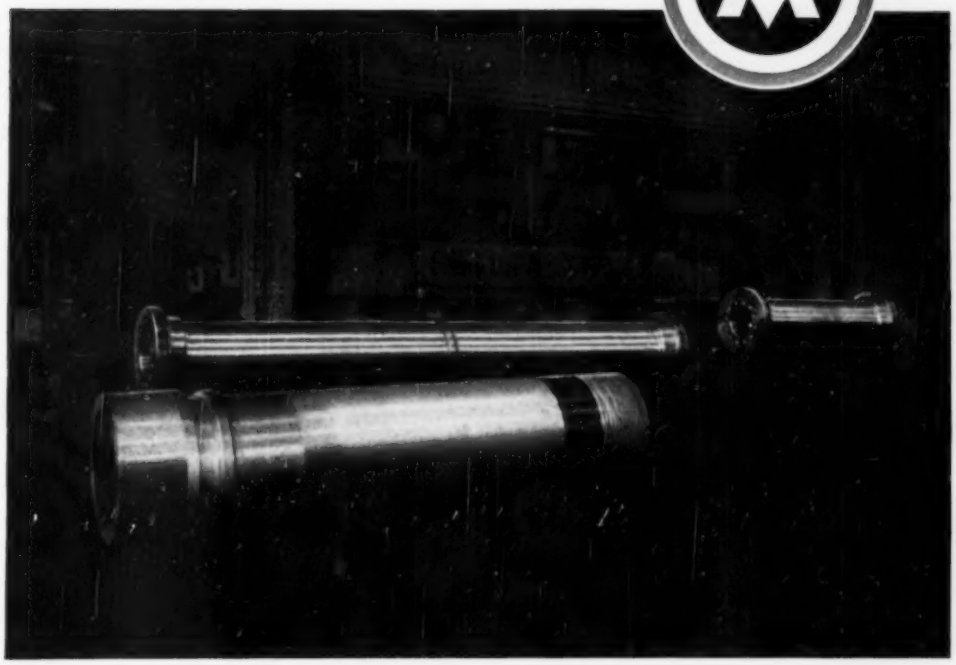
Refractory Materials. Frequency slope of the radiation of such materials was investigated in order to determine what composition of refractory materials would provide best heat transmission for use in industrial furnaces and directly heated high-temperature radiators. The radiation of such materials is improved considerably by admixture of metal oxides. Discussion includes problems of high-temperature technique, determination of emission spectrum, influence of impurities, comparison of emission of refractory materials under the same heating conditions, and also a number of graphs.

Digest from "Radiation of Refractory Materials" by C. A. Landfermann, *Chemie-Ingenieur-Technik* 21, No. 15-16, p. 295-297, 1949. (Published in Germany.)

Benzene and Alcohol. As anti-knock fuel these constituents are distinguished by their high octane number when mixed with other forms of fuel. This article gives numerous and long tables and graphs showing the action of these two compounds as knock inhibitors.

Digest from "Regularities in the Behavior of Knock Inhibitors. Part II. Anti-knock Fuel Constituents (Benzene and Alcohol) by T. Hammerich, *Brennstoff-Chemi* 30, No. 9-10, p. 159-168, 1949. (Published in Germany.)

—*End*



FORGED ONE-PIECE PRESSURE VESSELS

Extreme conditions of temperature, pressure and corrosion are best met by one-piece construction of *stainless steel.* Vessels such as these, built for a large chemical corporation, are homogeneous throughout. There are no welds to introduce complications. Midvale precision-machined the heads from solid forgings. Inspection confirmed perfect fits in each case. The Midvale Company, Nicetown, Philadelphia.

CORROSION AND HEAT RESISTING CASTINGS
FORGINGS AND RINGS

THE MIDVALE COMPANY
CUSTOM STEEL MAKERS TO INDUSTRY

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FACTS ON FILTERING

Representative case histories on widely varied clarification problems condensed from field reports of Johns-Manville Filtration Engineers

$127.50 Monthly Profit from Orange Oil Formerly Lost

(reported by J-M Engineer H. G. Martin)

LOS ANGELES DISTRICT: A citrus processor in my territory uses high-speed centrifuges for orange oil recovery. After two weeks' operation, there is an accumulation of about 100 gallons of sludge, which has a high content of orange oil. Settling and decanting this sludge yields 75 gallons of oil. By adding Celite to the remaining 25 gallons of heavy sludge formerly discarded and then pressing it, 5 more gallons of orange oil are recovered. Selling for $1.50 per pound, this means a saving of $130.00 in additional orange oil per month. Deducting $2.50 for the cost of Celite used, the operation shows a monthly net profit of $127.50.

Cutting Oil Recovery Increased 12 Times

(reported by J-M Engineer Carl Dietz)

CLEVELAND DISTRICT: This fabricating concern had recently set up an outfit for the recovery of cutting oil from brass, bronze and steel alloy turnings and cuttings. The outfit consisted of a horizontal plate filter, centrifuge, dirty oil tank, and clean oil tank. Having the usual starting-up troubles, they asked for my help.

I found that they had been attempting to operate the filter by pumping clean oil from the filter into a closed tank. This raised the pressure to an excessive level. After correcting this condition, I filled the filter by gravity before starting the pump. Using 7.5 lbs. of Celite 503 per 300 gallon batch, the entire batch was run through in less than an hour. It was apparent that they could take another 300 gallons through the filter—yet previously they had been unable to obtain a throughput of more than 50 gallons.

Since then, no trouble has been experienced. Customer states that in spite of high steam and air charges, he is able to recover his cutting oil at a cost of 3.5¢ per gallon.

Trouble Traced in a Varnish Plant

(reported by J-M Engineer R. J. Amberg)

DETROIT DISTRICT: Recently, a varnish company complained that their filter was not giving satisfactory performance, so I went to the plant to see if I could locate the difficulty. There I found that the hot varnish flows from an elevated storage tank into a 50-gallon drum where the filter aid is added. This drum supplies the filter. During the filtering run, I noted that the operator would occasionally allow the drum to empty and the pump would then pull air for as long as five minutes—draining the filter, "scouring" the filter element and rendering subsequent filtration almost impossible.

The operator was instructed to keep the varnish level well above the outlet pipe. Then, four 400-lb. drums were filtered at an average rate of 18 gallons per sq. ft. per hour with only 5 lbs. gauge pressure at the end of that period. Since that time, these people have had no recurrence of the difficulty.

Engineering Help Solves Filtration Problem

(reported by J-M Engineer G. F. Huber)

BOSTON DISTRICT: One of my customers was having difficulty due to the filter powder coming through the ceramic filter medium. I checked the operation with their technical director and found that incomplete venting of the air from the filter body during precoating permitted air to remain trapped in the upper part of the filter. This prevented the precoat suspension from filling the filter and depositing an even coat upon the stone. As the filtration was continued, the liquid level in the filter rose and gradually displaced the air but meanwhile, of course, some filter aid passed through the stone.

I suggested complete air venting at the start of the precoating and installing a valve on the outlet side. This change in operation resulted in a decided improvement and, needless to say, the customer was greatly pleased.

Your New Problem may be an old one to the CELITE Engineer

These case histories show not only what Celite Filter Aids can do but also how Johns-Manville Filtration Engineers can help you. Small, simple changes in equipment or technique often lead to big results because J-M Engineers combine scientific knowledge with wide practical experience on many filtration problems.

For additional information, write Johns-Manville, Box 290, New York 16, New York.

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Celite **Filter Aids**

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Chemical Engineer's Bookshelf

LESTER B. POPE, Associate Editor

The First Book on an Old Process

ION EXCHANGE—THEORY AND APPLICATION. Edited by Frederick C. Nachod. Academic Press, New York. 411 pages. $8.50.

A couple of years ago, after an ACS meeting in New York, a small dinner group was discussing theories and applications of ion exchange. The consensus was, as it always is, that someone should write a book. Ion exchange principles had been known for a hundred years, but only within the preceding eight or ten had they been applied outside of water conditioning. And hitherto secret war work was being declassified. The time was ripe for the first book on the subject.

So the next day Fred Nachod hotfooted it over to Academic Press and sold them the idea—with himself as editor.

Dr. Nachod was well qualified to corral and lead his experts—15 of them from both industry and campus. Born and educated in Leipzig, he studied at the universities of Paris, Freiburg, Leipzig and Utrecht. He obtained his doctorate at Utrecht in physical chemistry in 1938. He taught there and at CCNY and Columbia after coming to the United States in 1939. Industrial experience comprises Baker Platinum, Permutit, Atlantic Refining and, for the past three years, Sterling-Winthrop Research Institute. Dr. Nachod's interest in ion exchange dates back to the early forties when he directed and conducted research for Permutit. He has published more than two dozen papers and authored or coauthored five U. S. patents. Incidentally, his literary talents are well known to addicts of these pages. He has reviewed many books of theoretical interest.

It took only two years between the book's conception and delivery. That's a mighty short gestation in the book business. It shows cooperation between editor, publisher and printer. Also a lot of work keeping 15 different personalities and temperaments in line and preparing copy. Of the 3,000 copies printed nearly half have been sold. Russia was one of the best customers—the book is that good.

A good many chemical engineers are going to skip over the first three chapters. They will promise themselves, however, to come back to the complex mathematical background material. They will pass right to chapter four where Permutit's Gilwood holds forth on equipment design—well written, well illustrated. Water treatment, naturally one of the book's longest chapters, is next. It is a complete treatise on whys and wherefores. Sea-water desalting, applications to the separation of inorganic cations, applications in analytical chemistry, catalytic applications, and use in biochemical and physiological studies are the subjects of chapters 7, 8, 9, 11 and 12.

F. C. Nachod

"Ion exchange now takes its place. . ."

A trio of important applications comprise chapters 10, 13 and 14: metal concentration and recovery, separation of amino acids, and sugar refining and byproduct recovery. A short chapter on recovery of alkaloids and a longer one on miscellaneous applications wind up the text. The book itself ends with an appendix directory of exchangers and adequate author and subject indexes.

Engineers in industrial fields—water, organics, metallurgy and pharmaceuticals especially—will find many facets directly applicable to their problems. Maybe they'll even find their problems solved, either by the book or one of the literature references with which it is copiously sprinkled.

As a minor quibble, the editor is wrong in calling distillation and filtration unit processes. He's on safer ground when he classifies ion exchange as a unit process. Du Pont's T. H. Chilton has said that "it may be disputed whether ion exchange is a unit operation or a unit process, since chemical reactions are obviously involved, but in any case the importance that this process has achieved in the last few years requires that it be included" [in a discussion of progress in unit operations since 1939].

Dr. Nachod is already making plans for the second edition, but right now he's writing a mystery story. An unpopular atomic scientist is to be murdered. Cause of death is acute leukemia induced by radiations. Who dunit? Who got the lead out of the scientist's shielding? I don't know yet. Maybe I'll tell you more after Fred finishes his book.—*LBP*

A Source Book That Fulfills a Need

HEAT TRANSFER. By Max Jakob. John Wiley and Sons, New York. 758 pages. $12.

Reviewed by Donald Q. Kern

In his latest book, Dr. Jakob has fulfilled the expectations of those who have followed and admired his work. This book is an ambitious undertaking which fulfills the need for a source book in heat transfer. In addition, it provides a much needed survey of the German literature stemming from Dr. Jakob's familiarity with it. Covering the broad range of subjects which it does, considerable space has been devoted to the presentation of derivations and to the experimental methods accompanying the various phenomena.

Although the book is described by the publisher as a treatise and a text, it is primarily a treatise for research workers in the field of heat transfer. Starting with a brief introduction to conduction, convection and radiation, each is again subjected to a more extensive treatment. While not as intensive as the work of Carslaw and

(*Continued*)

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Jaeger on conduction, the mathematical basis for the various heat transfer effects is accorded an excellent exposition. In addition, Dr. Jakob has included a large number of derivations which have not appeared in the literature heretofore. The coverage of extended surfaces is particularly commendable and the treatment of the unsteady state represents an excellent collection and coordination of the subject matter. Numerous graphs have been presented to permit the rapid solution of some of the more involved methods. A section entitled "Special Mathematical Methods in Conduction" serves as an introduction to the theorems and methods most applicable to the complex problems arising in conduction. Similarly, the author has also presented what is by far the most extensive assembly of graphical methods for the solution of heat conduction problems. In line with the modern trend toward an intensive investigation of the boundary and buffer layers in thermal and dynamical transfer, the most useful mathematics and the comparison of theories receives a clear presentation. The book concludes with a section on evaporation and a section on condensation. The former contains a summary of Jakob's pioneer work while the latter is primarily a presentation of the 1916 work of Nusselt.

As a text the book is definitely beyond the undergraduate level. A group of problems is presented for each chapter which should, however, assist in the adaptation of the book as a graduate text, although these, like the various topics, are drawn from the physical rather than the chemical engineering field. The space allocated to the individual subjects is not consistent with their occurrence in industry, much space being given to mathematically developable subjects and less to the indeterminate problems. It is probable that the second volume, now in preparation, will provide a broader balance of the subject matter.

The literature is decidedly enhanced by the appearance of this book and while it is fairly expensive for its size, (Vol. I is $12) it will prove a rewarding investment because of the unique position its fulfills in the literature and the wealth of information it contains.

Emphasis on Rayon

PHYSICS AND CHEMISTRY OF CELLULOSE FIBRES. By P. H. Hermans. Elsevier Publishing Co., New York. 534 pages. $9.50.

Reviewed by Robert S. Aries

Dr. Hermans' book is a welcome addition to our growing literature on the fundamental aspects of cellulose technology, since it is much more than a well-collated literature review. The intimate experience of the author in rayon permits him to combine its physical chemistry and technology, adding his own interpretations and heretofore unpublished data. While experts might disagree on some points of the book and consider them controversial, Dr. Hermans' approach is fresh, original and a veritable contribution to the fields of cellulose and high polymers. Despite the availability of many similar titles, this book should prove a valuable addition to the libraries of all cellulose chemists and researchers.

Plastics (European)

ELASTOMERS AND PLASTOMERS. Vol. II—Manufacture, Properties and Applications. Edited by R. Houwink. Elsevier Publishing Co., New York. 515 pages. $9.

Reviewed by Walter Brenner

This book is the second in a series of three volumes on the chemistry, physics and technology of high polymers, edited by R. Houwink, external lecturer in the Technical University at Delft, Netherlands. Its 13 chapters contain a discussion of raw materials, manufacturing techniques, properties and applications of plastic materials. Individual topics are treated by one or more specialists in their respective fields. A total of 19 contributors is listed, the majority of whom (13) possess West European (British and continental) background and experience and are engaged there actively in industrial work at the present time.

The discussion of each of the many topics considered is preceded by a brief, generally well written summary of the chemistry and certain key reac-

(Continued)

RECENT BOOKS RECEIVED

Gas Transportation System Calculations. By B. Miller. Moore. $7.50.

Handbook of Chemistry. 7th ed. By N. A. Lange. Handbook Publishers. $7.

Molecules and Crystals in Inorganic Chemistry. By A. E. Van Arkel. Interscience. $3.85.

Organic Reactions. Vol. V. By Roger Adams. Wiley. $6.

Petroleum Chemicals Industry. By R. F. Goldstein. Spon, London. £3,3s.

Principles and Practice in Organic Chemistry. By H. J. Lucas & D. Pressman. Wiley. $6.

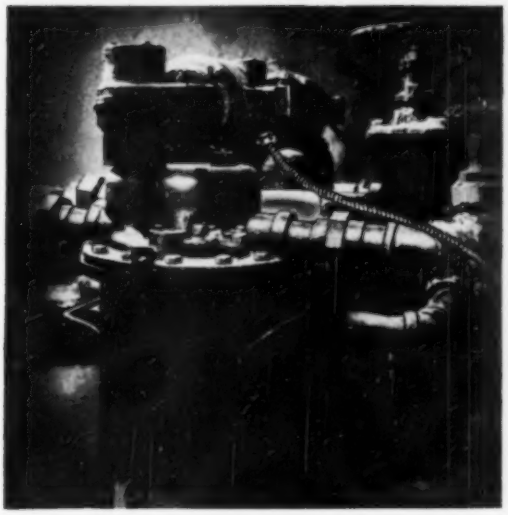
Principles of Organic Chemistry. By J. English & H. G. Cassidy. McGraw-Hill. $5.

Proceedings of the International Conference of Rheology. Interscience. $11.

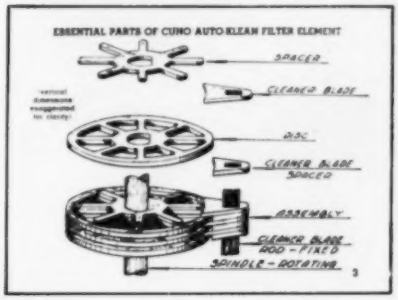
Spectroscopic Properties of Uranium Compounds. By G. H. Dieke & A. B. F. Duncan. McGraw-Hill. $2.75.

Surface Chemistry. Interscience. $6.

How to Make Soap 100% Pure

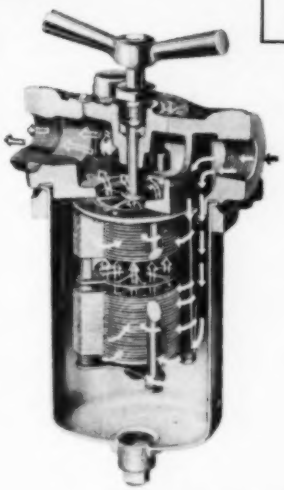


Answer: use a Cuno AUTO-KLEAN filter to remove pipe scale, atmospheric contaminants and other solids from the soap solution. Lightfoot-Schultz Company, maker of high-grade toilet soap, uses AUTO-KLEAN filters which are continuously cleanable without stopping production . . . and have operated for over 12 years with no interruptions for servicing or repair.



Guaranteed cleaning. Metal discs provide absolute certainty of removing *all* particles larger than specified.* Turning of discs past cleaner blades combs out collected solids and cleans out discs without stopping flow.

**Spacing available from .0035 in. to .062 in.*



Continuously cleanable feature permits single unit installations. Can be cleaned periodically by hand or continuously by motor drive, without shutting down operation.

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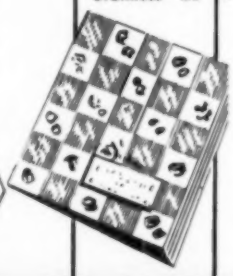

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tions of the materials to be discussed. Structural formulas are presented and some reaction mechanisms are indicated. Formulations given are based largely on British, Swiss, etc. industrial practice which is to be expected because of the contributors' extensive European experience. The discussion of manufacturing techniques and processes is of a largely qualitative nature and quite adequate within those limits. The many illustrations have been well chosen to enhance the value of the text. The wealth of data presented in the form of graphs and tables, also contributes to the value of this volume. The discussion is generally satisfactory although a few parts are rather sketchily presented which is understandable in view of the large mass of information available. The number of topics treated is quite large although, unfortunately, some late important developments have not yet been included such as polyester resins modified with unsaturated hydrocarbons whose use in low pressure molding and laminating work is steadily increasing. There is no discussion of economic factors, as comparative costs, tonnages produced, etc., and such would have been very interesting to the American reader especially in view of the continental background of the contributors.

The large mass of information collected in this book recommends it to those who desire to possess easily accessible information of this nature in a single volume. It might be especially useful to students taking courses in the high polymer field who require additional information on manufacturing techniques, processes, applications. The list of selected additional references at the end of each chapter should prove useful to those intending further study of any of the topics treated in this volume.

Abstracts

SILICONES AND ORGANIC SILICON COMPOUNDS. By Howard W. Post. Reinhold Publishing Corp., New York. 230 pages. $5.

Most chapters in this book summarize the literature that has been published on some phase of organosilicon chemistry. Names of the chapters indicate divisions and boundaries of the fields covered. They include: "Halogenated Silanes"; "The Work of Frederick S. Kipping and Others"; "Organic Compounds of Silicon Prepared at Moderate Temperatures"; "Organic Compounds of Silicon Prepared at Higher Temperatures"; "Uses

(Continued)

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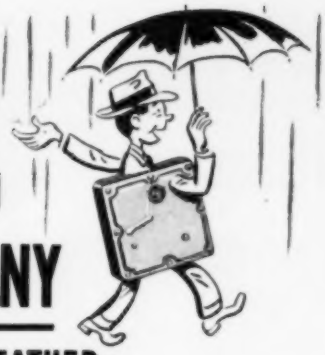

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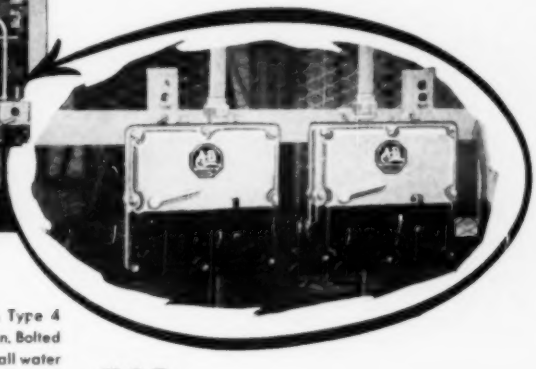

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of Polymerized Oxosilanes" and "Silico Organic Compounds Analogous to Ethers and Amines."

Essentially each chapter is a thorough chronological collection of abstracts with no particular critical emphasis. The book should be of considerably more service and interest to the specialist in the organosilicon field than to the student or casual reader. —*FA*

Furnaces

INDUSTRIAL ELECTRIC FURNACES. Vol. II. By V. Paschkis. Interscience Publishers, New York. 320 pages. $8.

Construction and operation of resistance furnaces and appliances and high-frequency capacitance heaters are covered in this second volume. In the first chapter there are sections on indirect- and direct-heat resistance furnaces and on resistance-type appliances. Another chapter covers high-frequency power supply, induction furnaces and appliances and high-frequency capacitance. There is a general chapter on selection of furnaces.

The author has attempted to put some basic unity into the electric furnace field. He has classified the furnaces and analyzed the bases for design and application. Thus he has made considerable progress in simplifying the search for the right furnace for a given use.

With the first volume (*Chem. & Met.*, Oct., 1945, p. 272), which deals with arc furnaces, electrode melting furnaces and specially designed ferroalloy furnaces, this survey includes all types of electric furnaces.—*FA*

Oil Know-How

PETROLEUM REFINERY ENGINEERING. Third Edition. By W. L. Nelson. McGraw-Hill Book Co., New York. 787 pages. $9.

Reviewed by M. Van Winkle

The Third Edition of Petroleum Refinery Engineering is a modernized and expanded version of the older editions and incorporates many of the newer developments in petroleum refining design and technology.

The book shows improvements throughout in organization and material included. Outstanding are those found in the chapters on refinery products, wherein up-to-date specifications and quality ranges are included; physical properties of petroleum wherein more recent correlations of oil properties have been added; vaporization

(*Continued*)

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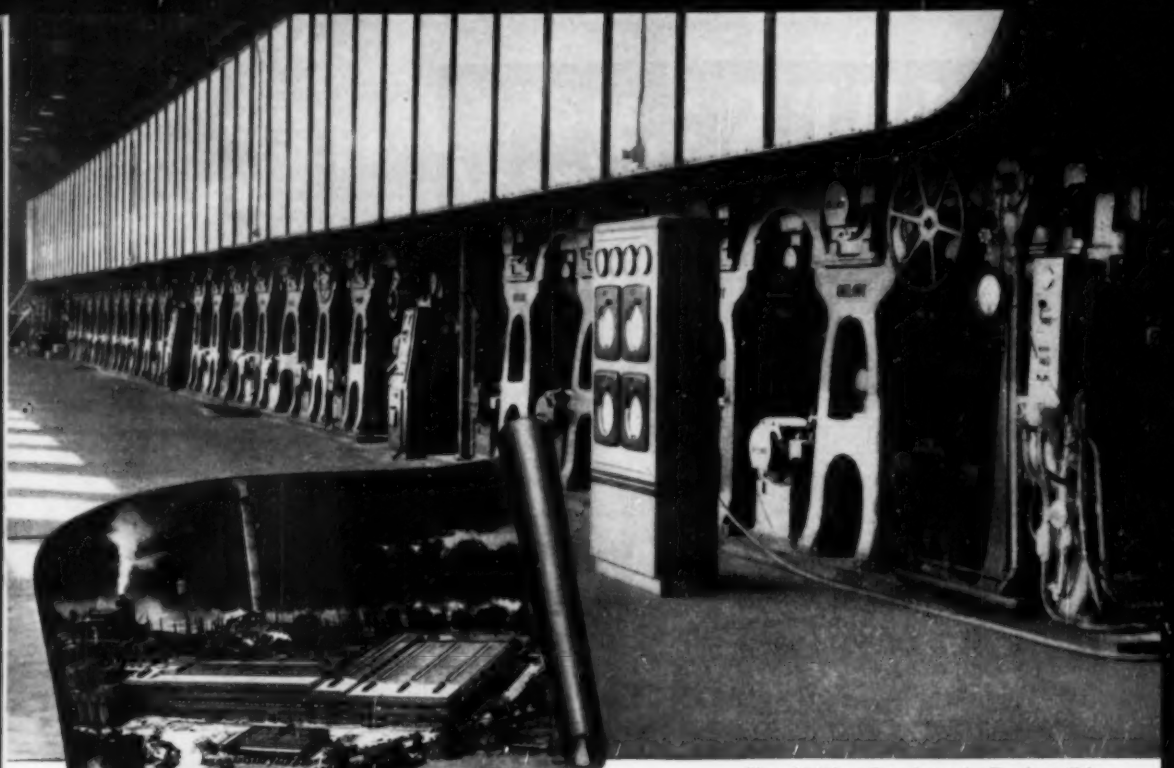

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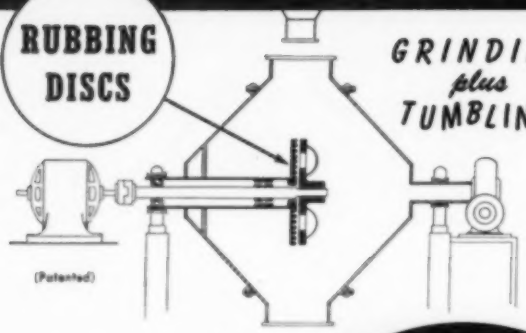

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and condensation, including newer design methods, and tube still heaters in which heater design has been more thoroughly covered. The new chapter on catalytic cracking also enhances the value of the book as a refinery engineering text and reference. The cost tables in the section on economics of design have been brought up-to-date.

Finally an author index, conspicuously absent in the older editions, has been added, and text material has been more thoroughly referenced.

The new third edition is recommended as a text in the study of refinery engineering and as a reference book for engineers in the refining industry. From the textbook standpoint the organization of the book for the logical development of the subject for students can not be considered ideal. However, this becomes a minor consideration in the light of the quantity and value of subject material contained.

With Hilger Instruments

ABSORPTION SPECTROPHOTOMETRY. By G. F. Lothian. Hilger and Watts, Ltd., London. 196 pages. $7.60.

Reviewed by Edwin K. Jaycox

Absorption Spectrophotometry, by G. F. Lothian, is a rewrite of "The Practice of Absorption Spectrophotometry with Hilger Instruments," by F. Twyman and C. B. Allsopp, the second edition of which appeared in 1934. As such, the author has done an excellent editorial job in revising the older material and in adding some new material in Parts I and II, which discuss respectively the principles and applications of spectrophotometry. Part III, "The Technique of Spectrophotometry," deals for the most part with techniques employing Hilger instruments and smacks of advertising for the Hilger company, with which I would have no quarrel if the original title had been retained and had included "With Hilger Instruments." Instruments, other than those manufactured by Hilger, are only very briefly treated. As an example, the discussion concerning the Beckman, Cary and Coleman spectrophotometers occupies one printed page and one line.

In Parts I and II the principles and applications of spectrophotometry have been given excellent treatment and are particularly well presented for the student and those who contemplate using spectrophotometry as a tool. The fundamental laws of spectrophotometry are discussed in a simple straightforward manner that can be

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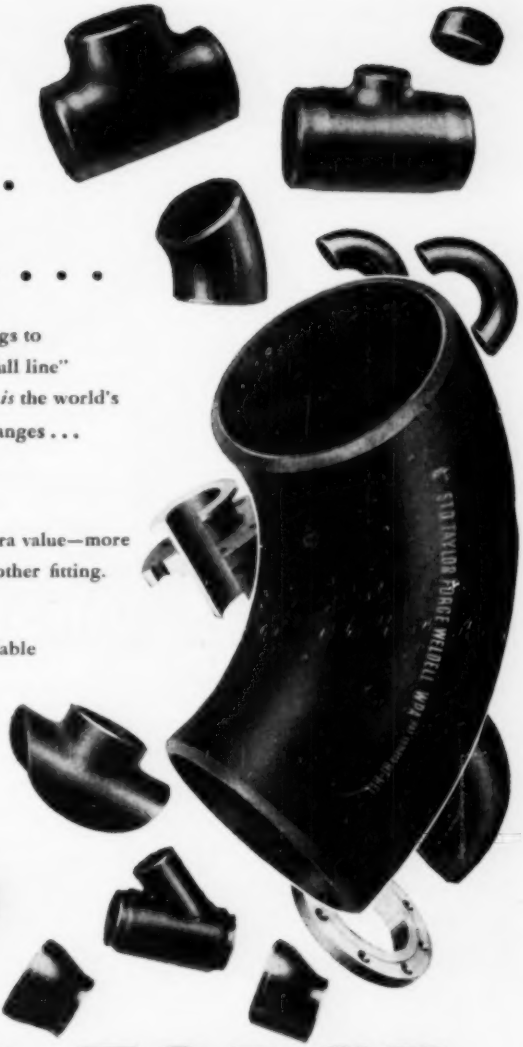

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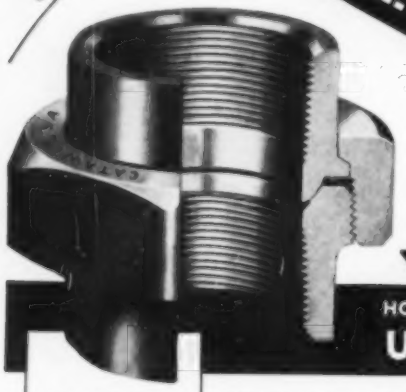

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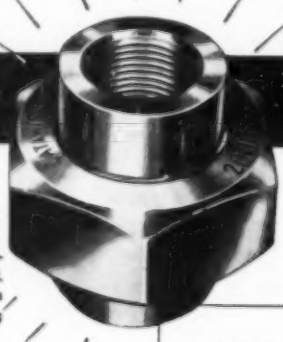

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understood by those who have not previously been well grounded in optics and the behavior of light. Representative applications of the art are cited and indicate the fields and problems in which absorption spectrophotometry can be expected to be useful.

The book is valuable as a reference handbook for the worker in the field of spectrophotometry, particularly parts I and II and also part III if he happens to be using Hilger equipment.

Flow

INDUSTRIAL RHEOLOGY AND RHEOLOGICAL STRUCTURES. By Henry Green. John Wiley and Sons, New York. 311 pages. $5.50.

Reviewed by George E. Alves

There has been a great need for a book on rheology in order to consolidate the many ideas and definitions involved in this complex but interesting field. The author states in the first paragraph of the preface that, "The intention of this book is easily stated. It is to give the laboratory man a workable rheological system: one based on accepted ideas which can be used either for research or for plant control purposes."

The book is divided into four parts, each part consisting of several chapters: Part I—A Rheological System; Part II—The System Applied to Laboratory Measurements; Part III—The Particle—The Basis of Rheological Structure; Part IV—Particle Groups Rheological Structures. There are also nine appendixes, including topics such as: deduction and modification of the Poiseuille equation; rotational viscometer bob end effects; determining the magnification of the electron microscope; measuring particle size with X-rays; notes for the laboratory investigator on topics such as, "selling" oneself and how to present papers. A bibliography and a glossary are appended.

The author's rheological system of non-turbulent flow types is: Newtonian, plastic, pseudoplastic, dilatant. Thixotropy is considered as a special property of some materials of the last three flow types. Flow of Bingham plastics and photomicrographs showing the difference between "plug" and viscous flow of a Bingham plastic in a capillary tube are discussed. The effect of slippage on the shape of the consistency curves for Bingham plastics and the use of the Buckingham equation in analyzing these curves are well presented. The discussion of pseudoplastic flow is very brief and no

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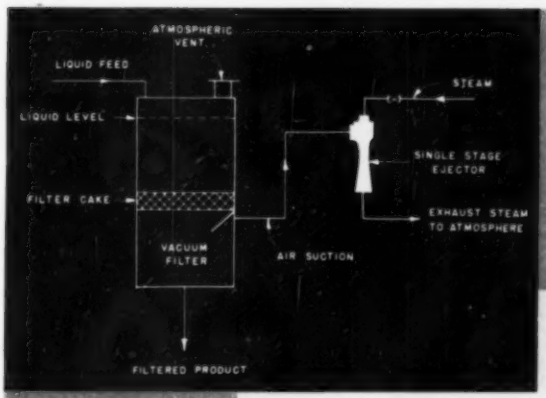
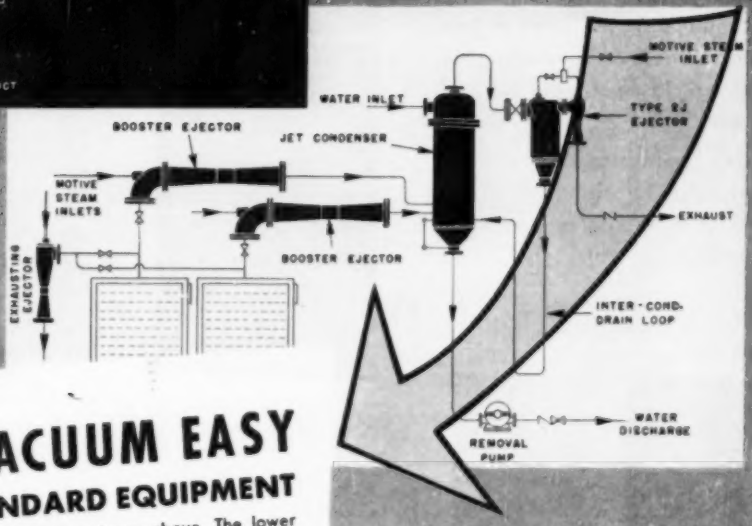


SIMPLE? YES

COMPLEX? NO



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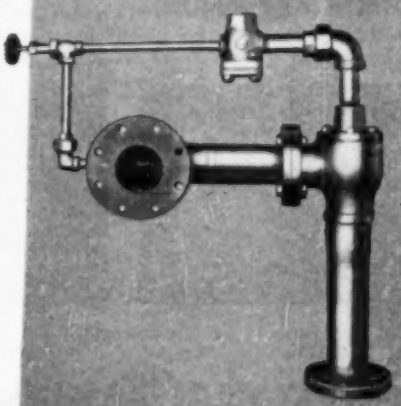

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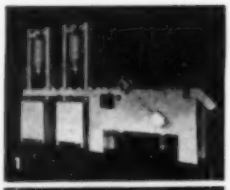
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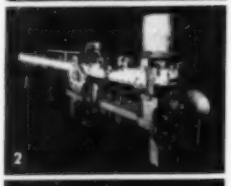
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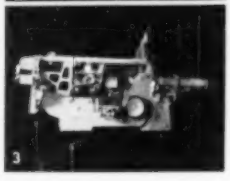
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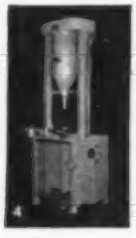
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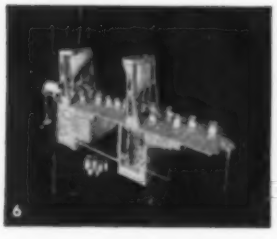
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mention is made of R. V. Williamson's theory. A very brief presentation of dilatancy is given; of interest is the shear diagram of a clay-water suspension exhibiting both dilatancy and thixotropy.

Two excellent chapters and parts of others are devoted to thixotropy. Typical shear diagrams of several common materials exhibiting thixotropy are given. It should be borne in mind that Green and Weltmann have contributed extensively to the study of thixotropy. Rheopexy is not mentioned; even though this phenomenon is unimportant, a brief mention of it should at least have been given.

Turbulent flow is discussed in less than one page. The author states that this type of flow is of more interest to the engineer than to the rheologist, and perhaps for this reason a more detailed presentation was not deemed necessary.

The rotational viscometer developed by the author, and which is now being manufactured in a modified form by the Precision Scientific Co., is described in detail. A very brief description of the Brookfield viscometer is given; however, no descriptions were given of the Stormer and MacMichael viscometers. It is felt that, since the Precision-Interchemical rotation viscometer is somewhat costly, a discussion on the construction and use of the Stormer and MacMichael viscometers would have been desirable. Various types of parallel-plate viscometers are discussed.

Application of the Reiner-Riwlin equations in analyzing rotational viscometer data of Bingham plastics is well explained. However, the discussion on the use of the Rabinowitsch-Mooney equation in analyzing data obtained in a capillary-tube or pipeline viscometer is very incomplete.

The last two parts, less than one third of the book, are very interesting. Use of the "white-light" microscope and electron microscope in the study of particle size and rheological structure is very well discussed. A detailed presentation is given on microscopy technique and methods of obtaining the particle size. The structures of Newtonian and non-Newtonian materials are explained, augmented with photomicrographs.

This book was prepared primarily for the laboratory investigator and is written in an easy reading style. Although the book is of little assistance in engineering design problems such as sizing pipelines for the flow of suspensions and slurries, it should nevertheless be of interest to engineers concerned with the general subjects of fluid flow, agitation, and mixing.

Recent Books & Pamphlets

Encyclopaedisch Chemicalien Adresboek. Published by Economic Documentation Office, Groest 116, Hilversum, Holland. 260 pages. A directory of Dutch manufacturers, importers, exporters, agents and brokers of chemicals and chemical products.

Survey of Industrial Carbon Requirements of the Pacific Northwest. By Ivan Bloch. Published by the Pacific Northwest Field Committee, U. S. Department of the Interior, 618 Southwest, Fifth Ave., Portland 4, Ore. 47 pages. Requirements, sources and potential sources of carbon in the Northwest.

Rubber Red Book. 1949 Edition. Published by The Rubber Age, 250 West 57th St., New York 19, N. Y. 923 pages. $5. Includes a list of rubber manufacturers in the United States and Canada, and a classified list of rubber products. There is also a who's who section, and sections on rubber machinery and equipment, chemicals classified and chemicals by brand names, rubber factories in the United States.

What Are New Chemicals Good For? Available from R. H. Ewell, Stanford Research Institute, Stanford Research Institute, Stanford, Calif. 34 pages. Proceedings of a symposium and round-table discussion held at the 115th national meeting of the American Chemical Society by its section on chemical marketing division of industrial and engineering chemistry.

Tetrachloroethane. Chemical Safety Data Sheet SD-34, published by Manufacturing Chemists' Association, 246 Woodward Bldg., Washington 5, D. C. 14 pages. 20 cents. Properties and data affecting safe handling and use.

Synthetic Detergents—Up to Date. By John W. McCutcheon, 475 Fifth Ave., New York 17, N. Y. 36 pages. $1. Review of the history, type and production of synthetics. Lists over 700 trade-name synthetic detergents and surface-active products. Reprinted from "Soap and Sanitary Chemicals."

Synthetic Fats—Their Potential Contribution to World Food Requirements. Published by the Food and Agriculture Organization of the United Nations, 1201 Connecticut Ave., N. W., Washington 6, D. C. 14 pages. 25 cents. Critical analysis of information available on the chemical synthesis of fatty acids.

British Plastics Year Book 1949. Published by Iliffe & Sons Ltd., Dorset House, Stamford St., London, S.E.1 England. 511 pages. 30 s. Such listings as manufactured products, names and addresses, and who's who in the plastics industry are sectioned off by labeled index cards.

American Gas Association Proceedings, 1948. Published by the American Gas Association, 420 Lexington Ave., New York. 713 pages. $7. This annual volume of proceedings is the only printing available of the numerous technical committee reports and articles presented to the association during its fiscal year.

An Evaluation of Sunniland Crude Petroleum. By H. E. Schweyer and C. H. Edwards. Bulletin Series No. 27, published by the Florida Engineering and Industrial Experiment Station, College of Engineering, University of Florida, Gainesville, Fla. 43 pages. Gratis. Experimental work carried out to determine the nature of oil produced in Florida and what products the oil may be expected to yield on refining.

What Can the Small Plant Do About Fly Ash. By Carl E. Miller. Published by Bituminous Coal Research, Inc., 912 Oliver Bldg., Pittsburgh 22, Pa. 8 pages. 25 cents. Deals with dust in stack gases from the small hand-fired or stoker-fired commercial and industrial boiler plant. Estimating price data is included for low- and high-resistance types of collectors.

The Combination in Chemicals That Counts Most. Published by the Cleveland Electric Illuminating Co., 75 Public Square, Cleveland 1, Ohio. 12 pages. Gratis. Highlights the advantages for the chemical industry in the Cleveland-northeast Ohio area.

A Guide to the Color Systems. Published by Kroch's Art Dept., 206 North Michigan

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Ave., Chicago 1, Ill. 8 pages. 25 cents; gratis for single copies. Nature and terminology of four different color systems are described. They are: Munsell, Ostwald, Cheskin and colorimetry.

The Zinc Industry. Published by the American Zinc Institute, 60 East 42nd St., New York 17, N. Y. 62 pages. Gratis. Recent production and consumption trends in the zinc industry.

Symposium on Aging of Rubbers. Special Technical Publication No. 89, American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. 72 pages. $1.75. Six papers review methods for accelerating aging of natural rubber and synthetic elastomers.

Lead Industries Association Proceedings. Published by Lead Industries Association, 420 Lexington Ave., New York 17, N. Y. 32. Twenty-first annual meeting. Features a panel on the production outlook for lead and some important lead products.

Canada Produces. Published by Canadian Foreign Trade Service, Rm. 406, 620 Fifth Ave., New York 20, N. Y. 48 pages. Gratis. A photographic review of industry in Canada.

Symposium on Industrial Gear Lubricants. Technical Publication No. 88 published by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. 19 pages. 75 cents. Three papers describing tests using various machines for the evaluation of heavy duty gear oils.

Tank Car Loading and Unloading Platforms. Manual Sheet TC-7, published by Manufacturing Chemists' Association, 246 Woodward Bldg., Washington 5, D. C. 12 pages. 20 cents. Outlines recommendations regarding the type of approach platform which should be used to load and unload tank cars safely. Describes and illustrates types of platforms already in widespread use.

Water Pollution Abatement Manual for Insoluble and Undissolved Substances. Manual Sheet W-2, published Manufacturing Chemists' Association, 246 Woodward Bldg., Washington 5, D. C. 12 pages. 20 cents. Seven sections cover: effect on receiving waters; permissible concentrations; removal of solids from waste; sludge digestion; sludge dewatering; sludge disposal; equipment sources.

Proceedings, Chemical Engineering Group, 1946. Vol. 28, published by Chemical Engineering Group, 56, Victoria St., London, S. W. 1, England. 114 pages. 21s. Annual report for 1946. Contains 11 papers.

Tuberculosis in Industry. Medical Series, Bulletin No. IX, published by Industrial Hygiene Foundation, 4400 Fifth Ave., Pittsburgh 13, Pa. 30 pages. 50 cents. Panel discussion of the medical conference held in connection with the 13th annual meeting of the foundation. Includes five papers.

Chemical Safety. Published by National Safety Council, 20 North Wacker Dr., Chicago, Ill. 6 pages. Offers suggestions for beginning new chemical operations with safety.

A World Tour in Oil. By Alfred M. Leeston. Published by A. M. Leeston, Continental Bldg., Dallas, Tex. 35 pages. 50 cents. Brief essays on the important oil countries of the world. Contains basic statistics and general maps.

Labor. Vol. IV, Industrial Resources of Tennessee, published by Tennessee State Planning Commission, 432 Sixth Ave., N., Nashville 3, Tenn. 25 pages. $1. Quantity and quality of Tennessee's labor force, legislation regulating employers and employees, and data on current wages and living conditions.

Isotopes. Catalog and Price List No. 2, published by Isotopes Division, U. S. Atomic Energy Commission, Oak Ridge, Tenn. 45 pages.

Engineering Progress at the University of Florida. Technical Paper Series No. 32 and Leaflet Series No. 10, published by Florida Engineering and Industrial Experiment Station, University of Florida, Gainsville, Fla. 26 pages. Gratis. Technical Paper No. 32 is on equipment for production of gum naval stores. Leaflet No. 10 covers corrosion research.

Magnesia Insulation. Published by the Magnesia Insulation Manufacturers Association, 1317 F St., N. W., Washington 4, D. C. 96 pages. Gratis. Manual on 85 percent magnesia insulation. Illustrated with line drawings and photographs.

Science, Engineering, Public Relations. Published by Massachusetts Institute of Technology, Department of Business and Engineering Administration, Cambridge, Mass. 96 pages. A symposium containing six papers covering specific areas of public relations in the light of their pertinence to the scientist and the engineer.

Tin and Its Uses. No. 20, published by the Tin Research Institute, 491 West Sixth Ave., Columbus 1, Ohio. 14 pages. A review including two plant articles, an article on tin-zinc plating and a discussion of tin's economic status.

Corrosion of Iron and Steel by Industrial Waters and Its Prevention. Special Report No. 41, published by the British Iron and Steel Research Association, 4 Grosvenor Gardens, London, S. W. 1, England. 56 pages. 5s. Discussion of causes, occurrence and prevention of corrosion of iron and steel in industrial plants.

Know Your Pennsylvania. Published by the State Planning Board, Pennsylvania Department of Commerce, Harrisburg, Pa. Descriptions and statistics on resources.

The Corrosion of Mild Steel by the Products of Combustion of Gaseous Fuels. By H. S. Pray, R. S. Peoples, R. S. Dalrymple and C. T. Sims. Published by American Gas Association, 420 Lexington Ave., New York 17, N. Y. 50 pages. 75 cents. Describes corrosion-testing methods and equipment. Graphs and tables show results.

Carbon Steel Wire. Section 16, Steel Products Manual, published by American Iron and Steel Institute, 350 Fifth Ave., New York 1, N. Y. 174 pages. 25 cents. Tolerances, methods of inspection, sampling and chemical analysis.

Alloy Steel Wire. Section 28, Steel Products Manual, published by American Iron and Steel Institute, 350 Fifth Ave., New York 1, N. Y. 83 pages. 25 cents. Tolerances, methods of inspection, sampling and chemical analysis.

Report on UN Conference on Conservation. By Robert S. Aries. Published by the Association of Consulting Chemists and Chemical Engineers, Inc., 50 East 41st St., New York 17, N. Y. 50 cents. Report and analysis of the United Nations Scientific Conference on the Conservation and Utilization of Resources.

Refractories. Published by the General Refractories Co., 1520 Walnut St., Philadelphia 2, Pa. 272 pages. $5. History, manufacture and uses of refractories are fully covered. Includes something of interest for anyone who designs, uses, purchases, constructs or supervises the operation of equipment requiring refractory materials. Attractively bound and illustrated.

Commercial Lignins. By Robert S. Aries and Arthur Pollak. Bulletin No. 29, published by Northeastern Wood Utilization Council, P. O. Box 1577, New Haven 6, Conn. 23 pages. $1. Abundance, sources and commercial uses.

Magnetic Properties. Published by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. 56 pages. $1. Compendium of tests for magentic, mechanical and electrical properties of magnetic materials. Several companion documents are included.

How to Do Business With the Quartermaster Corps. Published by Department of the Army, New York Quartermaster Purchasing Office, 111 East 16th St., New York 3, N. Y. 16 pages. Gratis.

Methyl Bromide. Chemical Safety Data Sheet SD-35, published by the Manufacturing Chemists' Association, 246 Woodward Bldg., Washington 5, D. C. 16 pages. 20 cents. Properties and data affecting safe handling and use.

The B.E.A. Today. The British Engineers' Association, 32 Victoria St., London, S.W. 1, England. 59 pages. Aims and activities of the association. Lists services available to interested firms outside the United Kingdom.

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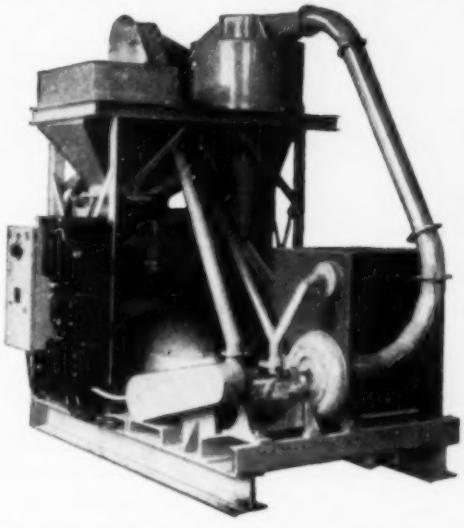

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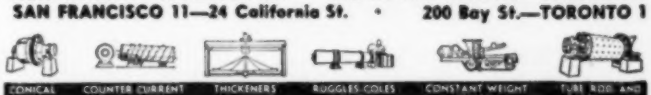

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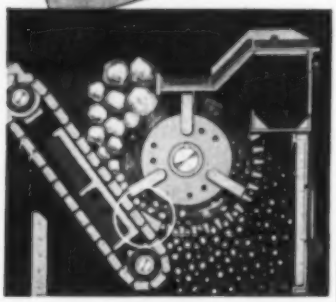

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GOVERNMENT PUBLICATIONS

The following recently issued documents are available at prices indicated from Superintendent of Documents, Government Printing Office, Washington 25, D. C. In ordering publications noted in this list always give complete title and the issuing office. Remittances should be made by postal money order, coupons, or check. Do not send postage stamps. When no price is indicated, pamphlet is free and should be ordered from the Bureau responsible for its issue.

Statistics. "Chemical Statistics Directory Number 2." Office of Domestic Commerce, unnumbered document. Price 20 cents. Lists 70 pages of references to sources of data regarding individual chemicals and related industrial materials.

Fluorine. "Fluorine in Foods." By F. J. McClure. Article in Public Health Reports, Aug. 26, 1949. Price 10 cents. Gives a summary of analytical studies which relates to food and chemical investigations. There is special reference to spray residues.

Iodine. "Iodine—A Food Essential." By W. H. Sebrell. Article in Public Health Reports, Aug. 26, 1949. Summarizes supply and health problems involved in iodine as an element of normal diet.

Labor. "Collective Bargaining Provisions—Union and Management Functions, Rights, and Responsibilities." Bureau of Labor Statistics, Bulletin No. 908-12. A resume by quotations from about 120 collective bargaining contracts indicating typical agreements in industry.

Agriculture. "Utilization of Farm Crops." A series of records of the hearings on S. Res. 36 which have been conducted before the Gillette subcommittee of the Senate Committee on Agriculture. These hearing reports summarize various chemurgic inquiries of which the first two published are "Industrial Alcohol" and "Corn." Those desiring to receive the various documents as issued should address the Committee on Agriculture, Senate Office Building, Washington, D. C.

Sugar. "The World Sugar Situation." Bureau of Agricultural Economics. Mimeographed report dated September 1949. This is a statistical resume with economic and technical interpretation giving data through the fiscal year 1948-49.

Electric Units. "Establishment and Maintenance of the Electrical Units." By F. B. Silsbee. National Bureau of Standards, Circular 475. Price 25 cents. A brief history with resume of the new system of electric units recently promulgated.

Wood. "List of Publications on Mechanical Properties and Structural Uses of Wood and Wood Products." Forest Products Laboratory, Madison 5, Wis. Report No. R200, revised.

Pulping. "Groundwood Pulping of Five Common Northeastern Farm Woodland Species." Forest Products Laboratory, Madison 5, Wis. Report No. R. 1743.

Weed Killers. "Chemicals Used in Weed Killing." By L. W. Kephart. Bureau of Plant Industry. Unnumbered mimeographed document. Brief description of each chemical with names of principal producers.

Fertilizer. "The Fertilizer Situation for 1949-50." Production and Marketing Ad-

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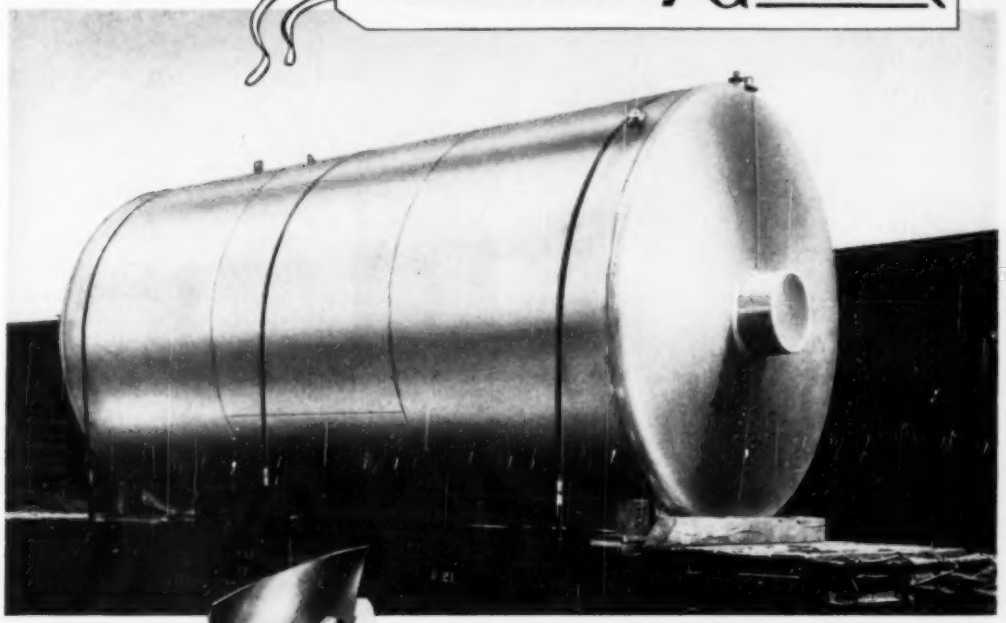

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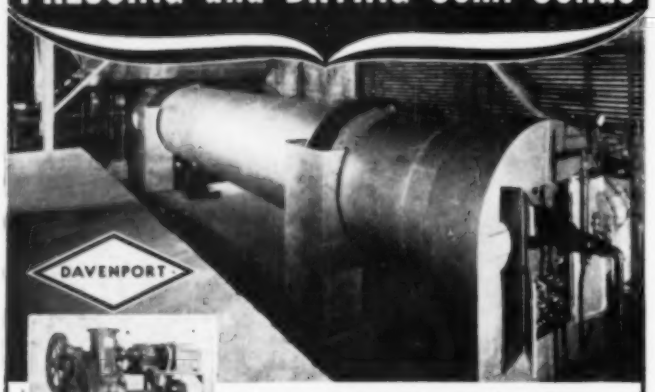

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ministration, U. S. Department of Agriculture. Unnumbered mimeographed document. Gives statistical summary past year and forecast for current year on nitrogen, phosphate, and potash components of fertilizers.

Insecticides. "Preliminary Estimates of Acreages of Crop Lands in the United States Infested With Some Organisms Causing Plant Diseases." Plant Disease Reporter, Supplement 185, Bureau of Plant Industry. Mimeographed. Furnishes basis for estimating next year's requirements of pest control chemicals.

Wood. "Zinc Naphthenate Wood-Preservative." National Bureau of Standards. Mimeographed preliminary specification and recommended commercial standard, TS-4859. Describes spray, brush, and dip materials.

Construction Materials. "Bibliography of Books and Published Reports on Gas Turbines, Jet Propulsion, and Rocket Power Plants." By Ernest F. Flock. National Bureau of Standards, Circular 482. Price 20 cents. Useful bibliography for those considering materials of constructions or materials for chemical propulsion.

Labor. "Labor Dispute in the Basic Steel Industry." Report to the President by Steel Industry Board. Unnumbered document released by executive offices.

Metallurgy. "Contributions to the Data on Theoretical Metallurgy." By K. K. Kelley. Bureau of Mines, Bulletin 476. Price 45 cents.

Catalysts. "Chemical and Thermomagnetic Studies on Iron Catalysts for Synthesis of Hydrocarbons." By H. Pichler and H. Merkel. Bureau of Mines, Technical Paper 718. Price 25 cents.

Coal. "Coal Carbonization: Ammonium Sulfate Yields from Coals of Various Regions of the United States." By D. A. Reynolds and D. E. Wolfson. Bureau of Mines, Report of Investigations R. I. 4526. Mimeographed.

Steel. "Pilot-Plant Production of Steel From Sponge Iron." By W. W. Stephens and J. L. Morning. Bureau of Mines Report of Investigations R. I. 4498. Mimeographed.

Gasoline. "Estimated Plant and Operating Costs for Producing Gasoline by Coal Hydrogenation." By L. L. Hirst, J. A. Markovits, et al. Bureau of Mines, Report of Investigation R. I. 4564. Mimeographed.

Clay. "Chemical Analysis of Clay." By Haskiel R. Shell. Bureau of Mines, Report of Investigations R. I. 4420. Mimeographed.

Titanium. "Production of Ductile Titanium at Boulder City, Nev." By F. S. Wartman, J. P. Walkey, et al. Bureau of Mines, Report of Investigations R. I. 4519. Mimeographed.

Asphalt. "Laboratory Study of Asphalts From Native Bitumens and Bituminous Sandstones." By Rethel L. Hubbard and K. E. Stanfield. Bureau of Mines, Report of Investigations R. I. 4522. Mimeographed.

Oil. "Analytical Distillation of Crude Oils at High Altitudes by the Bureau of Mines Routine Method." By Welton J. Wenger and John S. Ball. Bureau of Mines, Report of Investigations R. I. 4517. Mimeographed.

Aldehydes. "Sampling and Determination of Aldehydes in Diesel-Engine Exhaust Gas and in Mine Air." By Henry W. Busch and L. B. Berger. Bureau of Mines, Report of Investigations R. I. 4521. Mimeographed.

Aluminum. "Recovery of Aluminum From Crude Aluminum-Silicon Alloy by Extraction With Molten Zinc." By H. W. St. Clair and D. D. Blue. Bureau of Mines, Report of Investigations R. I. 4535. Mimeographed.

Mercury. "Investigation of New Idria Mercury Deposit San Benito County, Calif." By Russel R. Trengove. Bureau of Mines, Report of Investigations R. I. 4525. Mimeographed.

Fluorspar. "Methods and Costs of Mining Fluorspar from a Flat-Bedded Deposit at Cave-in-Rock, Ill." By A. B. Needham. Bureau of Mines, Information Circular I. C. 7514. Mimeographed.

—*End*

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In the first step, the wool is in contact with 5,000 gallons of twice previously used Esso Hexane, until this solvent is saturated with wool grease. After this naphtha is emptied, 2,000 gallons of intermediate naphtha (used once) is then introduced into the kiers and kept there for a certain time interval. When this intermediate Hexane is emptied, 3,000 gallons of pure Hexane is then used. This completes the degreasing procedure. After all the free liquid has been drained off, the final traces of solvent left in the wool are driven out with a heated inert gas and finally vacuum dried.

***Naphtha Process** wool scouring produces superior quality tops and yarns.*

Wool grease is used in compounding lubricants, greases, rust preventives, cutting oils, in leather and fur dressing products, and as a basic ingredient for animal vitamins such as irradiated cholesterol.

Esso Hexane Now Used at Arlington Mills

In the early history of this process, wide-cut petroleum solvents were used. Since early 1948, however, Arlington has used Esso Hexane, one of the new, highly refined close-cuts. Featuring a boiling range of less than 15°F and a high degree of purity, Esso Hexane costs no more than many solvents with much wider boiling ranges.

Esso offers a large selection of solvents with a variety of evaporation rates. Our technical men will be glad to analyze your solvents problems without any obligation. For further information on Esso Solvents, drop a line today to our sales office nearest your plant.

Aliphatic Hydrocarbons Cut Costs in Ethyl Cellulose Lacquers

To prevent yellowing of finishes in blonde and bleached wood furniture, the lacquer base of nitrocellulose is replaced with ethyl cellulose. The preferred solvent combination consists of 70-90% aromatic hydrocarbons with 30-10% alcohols. For even more economical solvent mixtures, petroleum distillates such as Esso Heptane and Esso VM&P Naphtha can be used to replace a high percentage of the aromatics. An excellent combination for uniform evaporation is isopropyl alcohol used in conjunction with Solvesso Toluol and Esso Octane.

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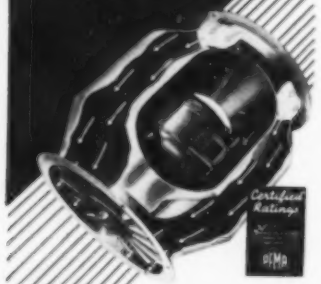

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MANUFACTURERS' LATEST PUBLICATIONS

Publications listed here are available from the manufacturers themselves, without cost unless a price is specifically mentioned. To limit the circulation of their literature to responsible engineers, production men and industrial executives, manufacturers usually specify that requests be made on business letterheads.

Heaters. A. Gunthard Co., Ennis, Tex.—4-page leaflet describes the operation of a hot water heater. Includes cross-sectional drawing and capacity chart.

Alcohol. Commercial Solvents Corp., 17 East 42nd St., New York 17, N. Y.—104-page booklet contains specifications, regulations and data on pure and denatured alcohols. Includes a section showing physical properties with tables and graphs.

Alloys. Duriron Co., Dayton 1, Ohio.—12-page General Catalog M tabulates composition, characteristics and corrosion resistance. Illustrates equipment in which alloys are used.

Emulsions. Carbide and Carbon Chemicals Corp., 30 East 42nd St., New York 17, N. Y.—72-page eighth edition of a booklet thoroughly discussing emulsification, industrial oil emulsions, wax emulsions, detergents and solvent emulsions. Includes formulations and methods of preparation.

Framing Structure. Unistrut Products Co., 1013 West Washington Blvd., Chicago, Ill.—24-page Catalog 500 covers channel members and all parts and fittings for building various types of all metal framing structures.

Organic Chemicals. Carbide and Carbon Chemicals Corp., 30 East 42nd St., New York 17, N. Y.—16-page Form 6136 entitled "Physical Properties of Synthetic Organic Chemicals" presents data in tabular form.

Insulation. Insul-Mastic Corp. of America, Oliver Bldg., Pittsburgh 22, Pa.—32-page booklet describes a spray-applied insulation for low temperature work. It is a mastic coating impregnated with granulated cork.

Wire Cloth. Robins Conveyors Division, Hewitt-Robins Inc., 270 Passaic Ave., Passaic, N. J.—16-page Bulletin 113-A gives tables on the sizes of openings available for a specific diameter of wire.

Motors. Allis-Chalmers Mfg. Co., 1147-A South 70th St., Milwaukee, Wis.—40-page Bulletin 05B6002A covers construction features of large direct-current motors. Contains sections on applications, construction, armature winding, and control.

Heptafluorobutyric Acid. Minnesota Mining & Mfg. Co., New Products Division, St. Paul 6, Minn.—16-page booklet discusses physical and chemical properties, reactions, applications, handling and toxicity. Includes four full-page graphs.

Steel Alloy. Duriron Co., Dayton 1, Ohio.—8-page Bulletin 502 describes sheet and plate from low carbon, austenitic stainless steel alloy. Discusses its corrosion resistance, fabrication and applications.

Corrosion Resistance. H. M. Harper Co., 2620 Fletcher St., Chicago 18, Ill.—Cardboard slide rule device shows resistance of seven alloys to various corrosive chemicals.

Refractories. Walsh Refractories Corp., Dept. M, 101 Ferry St., St. Louis 7, Mo.—Reference table gives properties, typical applications and other data.

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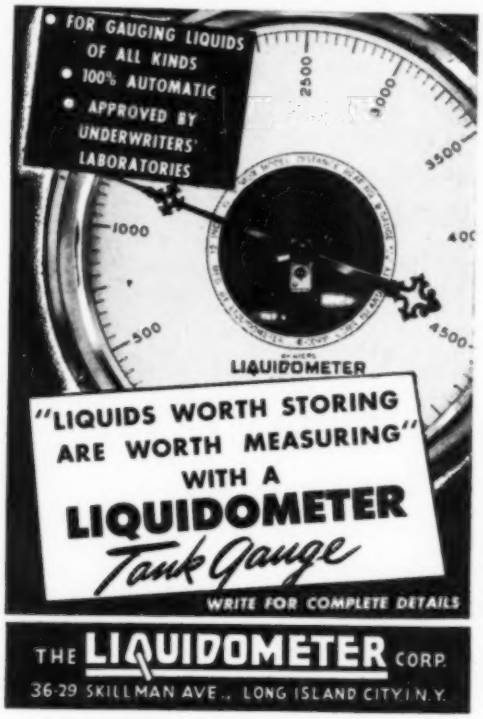

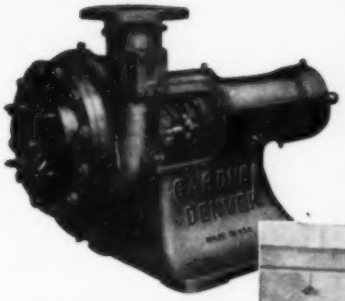

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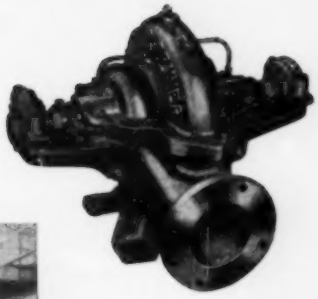

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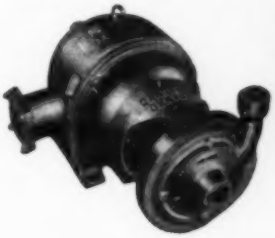

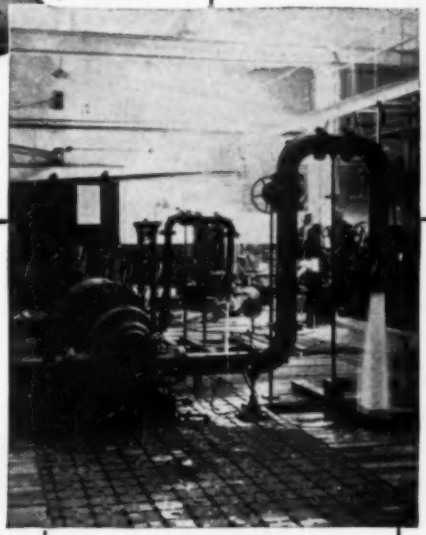

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Mercury Switches. Minneapolis-Honeywell Regulator Co., Brown Instruments Division, Wayne & Roberts Aves., Philadelphia 44, Pa.—16-page Catalog 1343 describes features, manufacture, testing and typical applications. Contains selection tables and specification charts.

Valves. Ross Operating Valve Co., 120 East Golden Gate Ave., Detroit 3, Mich.—8-page Bulletin 302 includes typical installation diagrams of in-line mounting master valves and pilot valves.

Condensate Return. Cochrane Corp., 17th St. & Allegheny Ave., Philadelphia 32, Pa.—24-page Publication 3250 discusses system of condensate drainage control.

Materials Handling. Bin-Dicator Co., Dept E-502, 12946 Kercheval Ave., Detroit 15, Mich.—4-page leaflet illustrates construction and applications of an aerating device to provide uniform flow of bulk materials.

Conveyors. Lippmann Engineering Works, 4603 West Mitchell St., Milwaukee 14, Wis.—32-page Bulletin 1400 gives specifications, dimensions and weights on portable belt conveyors.

Chloral. Food Machinery and Chemical Corp., Westvaco Chemical Division, 405 Lexington Ave., New York 17, N. Y.—28-page Bulletin 206 gives reactions and uses of chloral.

Classifiers. Dorr Co., 570 Lexington Ave., New York 22, N. Y.—4-page Bulletin 2281 illustrates construction and operation. Step-by-step mechanical action is shown by a series of photographs.

Conveyors. Continental Gin Co., Industrial Division, Birmingham 2, Ala.—64-page Data Book ID-481 gives dimensional and price information on all elements necessary to build a complete belt conveyor. A section on construction and design illustrates typical layouts.

Expansion Joints. Cook Electric Co., 2700 Southport Ave., Chicago 14, Ill.—20-page Catalog 50 describes application of packless bellows type expansion joints and bellows adaptations to piping installations.

Fume Duct Linings. Ceilcote Co., Rockefeller Bldg., Cleveland, Ohio.—2-page flyer covers formulation, chemical resistance and application instructions.

Conveyors. Island Equipment Corp., 27-01 Bridge Plaza North, Long Island City 1, N. Y.—16-page Bulletin FC18-1A-2 contains specifications and illustrations of the use of a double-flex chain and case conveyor.

Gages. Baldwin Locomotive Works, Testing Equipment Dept., Philadelphia 42, Pa.—12-page price list covers strain gages, instruments and accessories.

Safety. Mine Safety Appliances Co., Thomas and Meade Sts., Pittsburgh 8, Pa.—2-page Bulletin DZ-3 describes the operation of a nitrogen dioxide detector for concentrations between 1 and 500 ppm.

Instruments. Fisher Governor Co., Marshalltown, Iowa.—8-page Bulletin 3500 describes a force balance type valve controller. Labeled diagram shows principle of operation.

Pipe. Taylor Forge & Pipe Works, P.O. 485, Chicago 90, Ill.—4-page Bulletin 492 tabulates sizes and wall thicknesses available in spiral-weld pipe.

Bearings. Link-Belt Co., 307 North Michigan Ave., Chicago 1, Ill.—112-page Book 2550 contains construction features, prices, weights, load ratings and dimensions for ball and roller bearings.

Pulp Bleaching. Buffalo Electro-Chemical Co., Station B, Buffalo 7, N. Y.—Compilation of information on pulp bleaching with hydrogen peroxide.

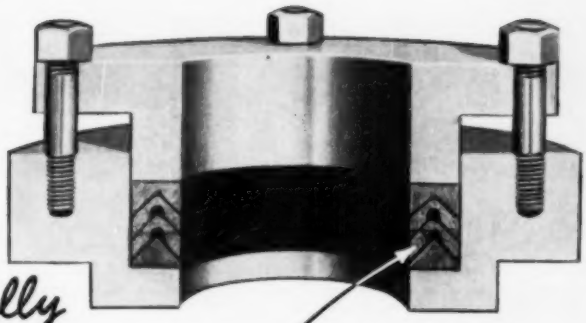
Instruments. Fischer & Porter Co., 50 County Line Rd., Hatboro, Pa.—24-page Catalog 50 describes primary and secondary flow instruments and control valves. Contains diagrams showing typical installations.

Alloys. Bethlehem Steel Co., Bethlehem, Pa.—Black and white sound motion picture entitled "Alloy Steels—A Picture of Con-

(Continued)

QUESTION:

Which Garlock rod packing automatically adjusts itself to changing pressures?



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trolled Production." Showing time: 43 min. Available in both 16 and 35 mm.

Tanks. California Redwood Association, 405 Montgomery St., San Francisco 4, Calif.—Two 4-page leaflets on the properties of redwood tanks. Sheet 3 covers their use in chemical plants; sheet 7 covers their use for the pulp and paper mill.

Dust Collectors. Aget-Detroit Co., Ann Arbor, Mich.—36-page catalog illustrates applications in grinding, buffing, polishing and sanding.

Deaerators. Cochrane Corp., 17th St. & Allegheny Ave., Philadelphia 32, Pa.—35-page Catalog 3005 describes de-aerating principle and illustrates various types of application.

Scales. Yale & Towne Mfg. Co., Philadelphia, Pa.—Bulletin P1159 contains drawings and tables giving dimensions and specification for a line of bench scales. Photographs show construction features and applications.

Instruments. General Electric Co., Schenectady 5, N. Y.—20-page Bulletin GEA-5233 covers telemetering instruments for current, voltage, pressure, flow, etc.

Equipment. Brown-Hutchinson Iron Works, 1831 Clay St., Detroit 11, Mich.—8-page leaflet illustrates the types of metal equipment that this company makes to order.

Dust Control. American Wheelabrator & Equipment Corp., 720 Byrkit St., Mishawaka, Ind.—4-page Bulletin 202 reports on method of controlling dust in the manufacture of pesticides.

Steel. Lukens Steel Co., 503 Lukens Bldg., Coatesville, Pa.—32-page pictorial survey of this company's products and facilities. 4-page leaflet gives sizes of heavy plate stock.

Plastics. Rogers Corp., Plastics Div., Manchester, Conn.—Folder describes plastics materials and fabricating services.

Instruments. Bristol Co., Waterbury 20, Conn.—12-page Bulletin P1242 explains theory of radiation pyrometry and the unit made by this company. Illustrates accessories.

Paint. Stonhard Co., 500 Stonhard Bldg., Dept. CE, 1306 Spring Garden St., Philadelphia 23, Pa.—4-page flyer covers corrosion resistance and method of application of a plastic paint.

Tube Fittings. Parker Appliance Co., 17325 Euclid Ave., Cleveland 12, Ohio.—60-page Catalog 203 includes design data, specifications, materials and general dimensional data.

Safety Switches. Trumbull Electric Mfg. Co., Plainville, Conn.—4-page Bulletin TEC 302A discusses types of applications, standard models, horsepower ratings of heavy-duty safety switches.

Drafters. Charles Bruning Co., 4754 Montrose Ave., Chicago 41, Ill.—4-page Bulletin A-1062 describes and illustrates the features of a device combining the functions of T-square, straightedge, triangles, protractors, and scales.

Instruments. Baird Associates, Inc., 33 University Rd., Cambridge 38, Mass.—8-page Bulletin XXXI illustrates and describes an automatic, recording, gas analyzer.

Centrifuge. Specialized Instruments Corp., 628 O'Neill Ave., Belmont, Calif.—4-page Form 28849L4 illustrates a preparative laboratory centrifuge. Table gives size, weight, electrical characteristics, vacuum-pump capacity and rotor-design and operation data.

Process Equipment. Allis-Chalmers Mfg. Co., 1147 South 70th St., Milwaukee, Wis.—20-page bulletin 25B6177D provides a buying guide for process equipment. Equipment covered includes pumps, pulverators, crushers, coolers, and dryers.

Agitators. Eclipse Air Brush Co., Pneumix Division, 346 Park Ave., Newark 7, N. J.—28-page booklet illustrates and describes applications of eleven types of air-motored agitators. Photographs of various installations are accompanied by explanations of use in each instance.

—*End*

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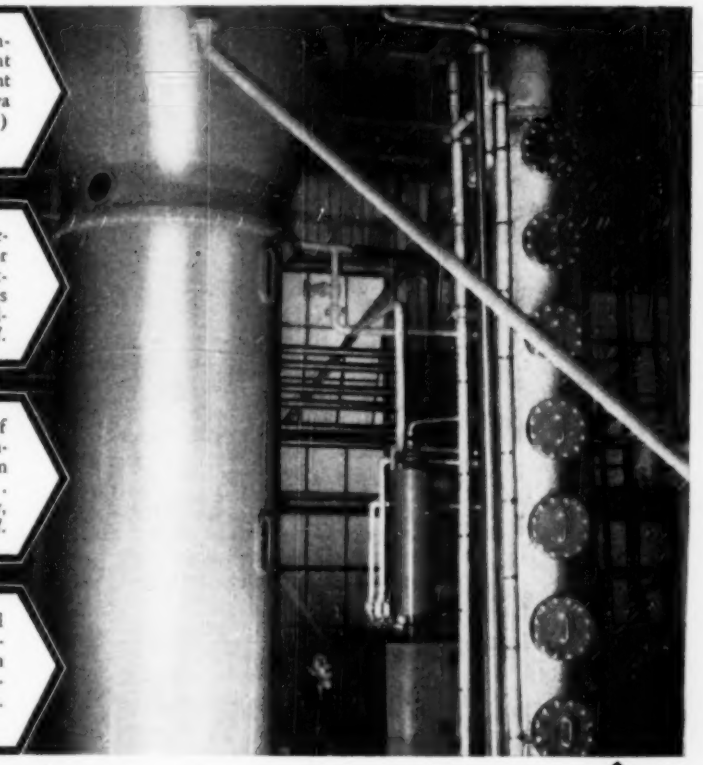

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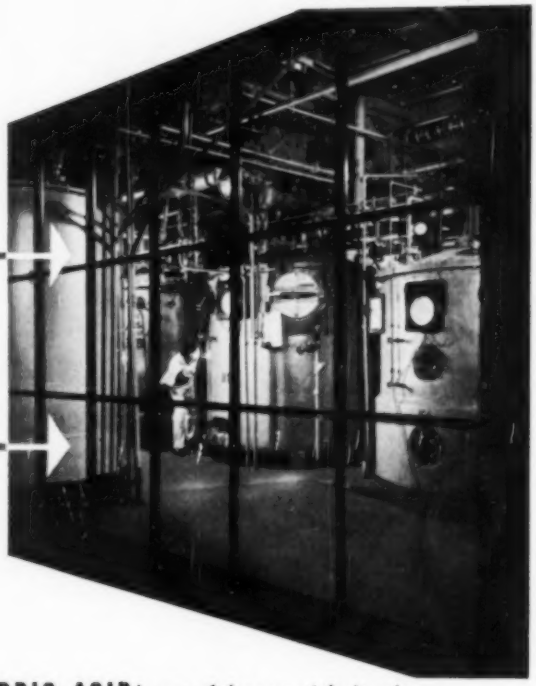

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Chemical Economics

RICHARD F. WARREN, Market Editor

Fall Comeback of Chemical Consumption Hit By Strikes in Several Industries

Labor troubles piled up on several fronts in the chemical industry last month. Strikes in the steel and coal industry created problems as the supply of benzene from byproduct coke operations fell to a trickle. About 350,000 gal. of benzene were lost to industry every day that the strike continued. Less than 100,000 gal. per day come from non-steel coking operations. Phenol supplies were also hit by the steel shutdown.

Diamond Alkali's Painesville, Ohio, plant also dropped out of the producing column last month due to a strike. The unit produces soda ash, caustic soda, chlorine, sodium bicarbonate, chromates, and calcium carbonate. While the shutdown created some supply dislocations, it temporarily tightened the over-all supply situation in caustic soda.

Devaluation and dollar shortages also entered the soda ash picture last month. British firms were offering ash at the same delivered price Canadian firms were paying for the U.S. product. In dollar-short Canada, the result was a switch to the British suppliers. More switching like this can be expected. It is important to follow the trend in exports and imports to devaluated areas in spite of the fact that these markets make up only a small part of our total chemical consumption. In many cases they may mean the difference between peak operations and financial worries in offices of chemical executives.

However, there were several bright spots in the process industries as the end of the year approached. Textiles, especially rayon, jumped back from their slump. In September, rayon deliveries reached 100 million pounds. This was almost double the April rate, and was almost 9 million pounds above the average 1949 rate of consumption. In October it looked like chemical consumption in rayon might reach an all-time high in 1950.

Consumption of chemicals in oil refineries was approaching the corresponding 1948 rate in October. After running considerably behind the pace set last year, refinery operations have picked up sharply from the July-August low.

Activity in two other major chemical consuming markets picked up in August. Fertilizer consumption of chemicals in August was more than 5 percent above the July level. Paint, varnish and lacquer firms used about 15 percent more chemicals in August than they consumed in July.

Western Exports Up

There has been considerable speculation on the size of the West Coast's foreign trade. This month C. C. Concannon, chief, chemicals branch, Office of International Trade, revealed some data which, for the first time, gave a quantitative measure of the importance of western ports in import-export trade. He stated that combined chemical import-export of California, Oregon and Washington today is more than three times as large as it was in 1938. It approximates $75 million a year.

In 1948, on the basis of dollar value, the West Coast had the same percentage share of the nation's total imports as it had in 1937. Dollarwise, West Coast exports in 1937 were 14.5 percent of the national total. By 1948 that percentage had shrunk to 7.4 percent. Chemicals, however, were in sharp contrast to this pattern. The value of chemical exports in 1937 was 9 percent of the nation's total, and in 1948, 6 percent. While United States exports in 1948, compared with 1937, declined one-half, West Coast exports declined only one-third, according to Mr. Concannon.

Chemical exports from San Francisco have quadrupled in value since prewar years, the most conspicuous rise is in the medicinal and pharmaceutical preparations group. Sixty or more individual classes of exports made up the impressive total of $8,300,000 moved out of San Francisco harbor in 1948. Growing exports of industrial chemicals from the Bay area since 1945 have raised the importance of the chemical and drug group, which has nearly doubled from 3 to 4 percent immediately prior to the war to a post-war volume of 5 to 7 percent of all exports.

Exports of chemicals and allied products through the port of San Diego jumped in value nine times from 1938 to 1948—to $1,128,000 from $134,000. In 1948 this trade was entirely with Mexico, except for a little ready-mixed paint sold to Argentina.

Los Angeles is a manufacturing center and its activity in the industrial chemicals group, particularly the alkalis, acids, borates, and fertilizers, has been mounting for some time. The rapid expansion of industry in the area is reflected in the growth of its chemical export trade—the 1948 figure is almost triple that of 1938.

Nearly 40 percent (136,000,000 lb. valued at $3,700,000) of all soda ash exported in 1948 originated in the Pacific Coast area where the world's largest producer of the natural is located. India, the outstanding purchaser, took 20 percent of all this nation's ash exports. Most of this was shipped from Los Angeles.

Oregon's exports of chemicals and allied products in 1948 ($1,343,000) showed a striking increase over those of 1938, although its total was but a small part of West Coast trade. Industrial chemicals accounted for $814,000 in 1948; 1938 shipments totaled only $2,000. This foreign trade growth reflects the upsurge in West Coast chemical manufacturing activity.

Price Trends

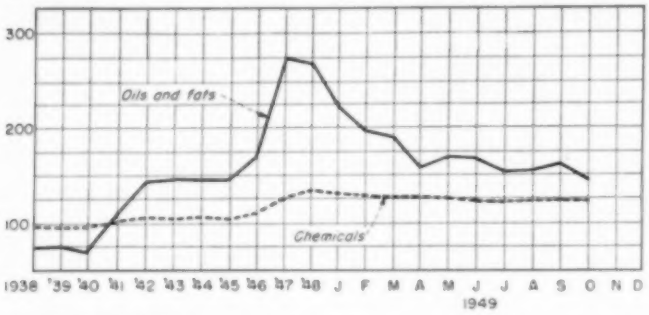
Chemical Engineering's indexes on both industrial chemicals and fats and oils dropped again last month as lead and tin dropped off, creating a dip in the metallic salts. Tetraethyl lead fuel additive reflected the drop.

While the steel strike cut sharply into the supply of benzene, creating worries for synthetic phenol producers, no price changes had occurred up to the first of November. Naphthalene, toluene and xylene supplies were also tight last month, but no price changes appeared.

Vegetable oils caused the biggest drop in the fats& oils index as it fell toward the 1942-45 level.

PRICE, CONSUMPTION AND PRODUCTION TRENDS

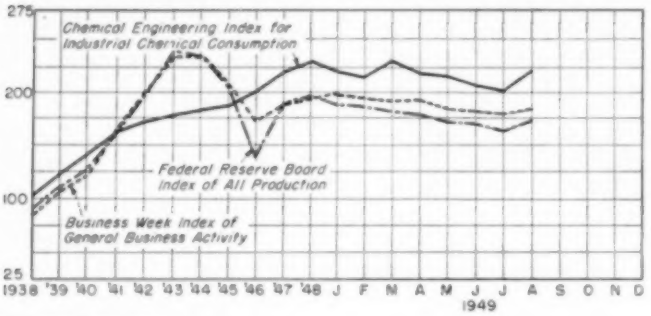
PRICES



Chemical Engineering's Price Index
A month, a year, and two years ago.

	Chemicals	Oils & Fats
As of November 1..	121.28	139.09
Last month	123.02	144.67
November 1948....	135.25	248.23
November 1947....	128.40	252.98

CONSUMPTION

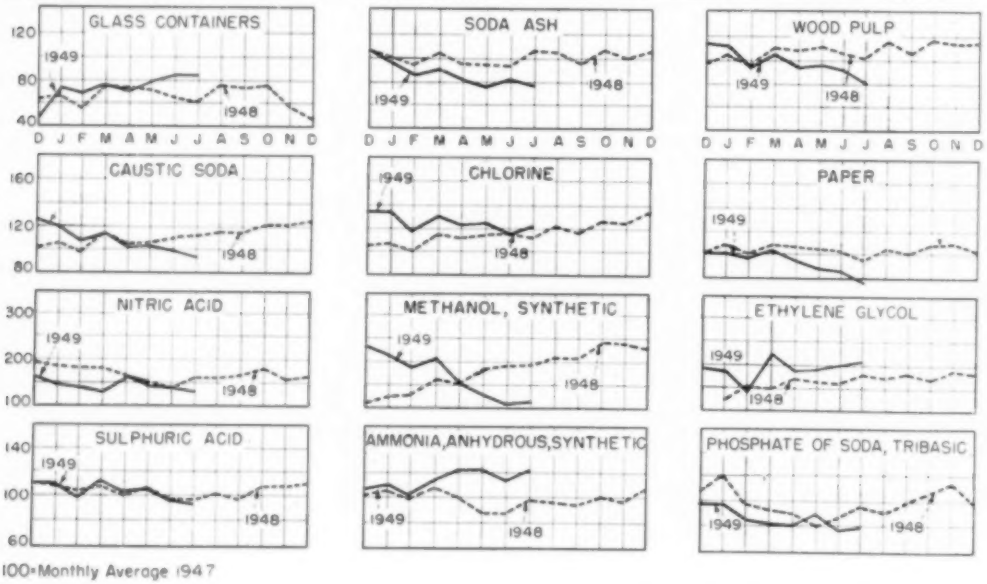

275
200
100
25
Chemical Engineering Index for Industrial Chemical Consumption
Federal Reserve Board Index of All Production
Business Week Index of General Business Activity
1938 '39 '40 '41 '42 '43 '44 '45 '46 '47 '48 J F M A M J J A S O N D
1949

Chemical Engineering's Consumption Index for Industrial Chemicals

(A breakdown by consuming industries)

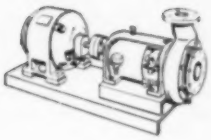
	July (Revised)	August
Fertilizers	49.91	52.70
Pulp and paper.....	17.80	22.55
Petroleum refining...	22.11	22.35
Glass	19.38	19.80
Paint and varnish...	20.42	24.50
Iron and steel.....	10.61	12.51
Rayon	20.02	22.38
Textiles	6.96	9.50
Coal products	9.56	9.59
Leather	3.73	4.41
Explosives	8.19	7.80
Rubber	4.06	4.53
Plastics	7.86	9.66
INDEX	209.61	222.24

PRODUCTION



100=Monthly Average 1947

THREE REASONS WHY THEY'LL GIVE YOU BETTER SERVICE . . .



❶ I-R Chemical Pumps are Built for Easy Maintenance — and less of it

These pumps are ruggedly constructed to last longer on the job — and the simple design, with all parts easily accessible, means less "time out" for maintenance. Here are just a few of the many I-R features that add up to maximum performance, minimum maintenance, and high operating efficiency. For complete details, contact your nearest I-R engineer.

1. The impeller is of simple, one-piece construction, provided with balancing ports so that the stuffing box is under suction pressure.

2. The short, rigid, stainless-steel shaft prevents impeller whip and eliminates many stuffing-box problems.

3. The deep stuffing box holds 5 to 7 packing rings and a seal cage, and can be packed solid or arranged for internal or external seal. The packing is always especially selected for the liquid to be handled.

4. Two heavy-duty ball bearings provide rigid support for the rotor. The bearings are oil-lubricated and the oil is automatically maintained at the proper level.

5. The discharge nozzle is an integral part of the casing, and its vertical position makes the pump self-venting.

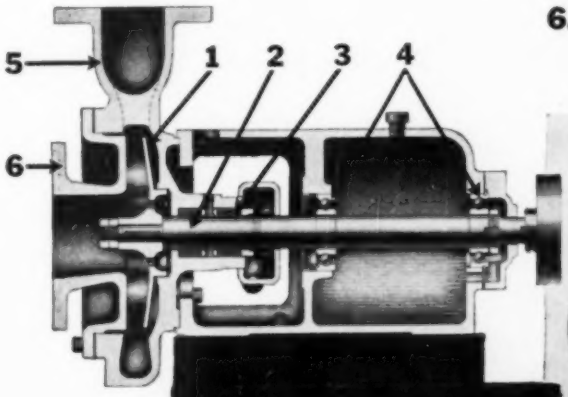
6. The suction nozzle is removable, permitting easy access to the impeller without disturbing the discharge piping.

❷ They are ARMORED AGAINST CORROSION — with *IRCAMET*

Ingersoll-Rand chemical pumps are built to stand up under the continuous handling of corrosive and abrasive liquids. All parts of the pump that come in contact with the liquid are made of IRCAMET — a high nickel-chromium-molybdenum alloy steel developed exclusively by I-R for chemical pump service. Laboratory tests and years of field experience have proved its exceptional ability to resist the corrosive action of a wide variety of acids and alkalis. Other materials are available for special operating conditions.

❸ They are PROTECTED AGAINST LEAKAGE —with the *LEAKOLLECTOR*

The patented LEAKOLLECTOR stuffing-box gland — an exclusive feature of all I-R chemical pumps — provides a simple and effective solution to the problem of pump leakage. It completely encircles the stuffing box, trapping all leakage so that it can be drained away for collection or disposal. The split gland is accurately fitted to both the inside and outside of the box, and will catch any seepage escaping between the shaft and packing, or between the packing and the bore of the box. The LEAKOLLECTOR is easily removed from the shaft for repacking the box.



I-R Chemical Pumps are of the centrifugal type, of simple cradle-mounted design, coupled to the driving motor. They are available in sizes to handle up to 4000 gpm at temperatures to 800° F.

The CAMERON SHAFT SEAL can be installed on all I-R chemical pumps to replace the conventional stuffing-box packing. It eliminates stuffing-box leakage and requires practically no attention or maintenance.

Ingersoll-Rand

CAMERON PUMP DIVISION
11 BROADWAY, NEW YORK 4, N. Y.

364-10

A Commodity Survey:

AMMONIUM SULPHATE

Non-byproduct supplies are growing as consumption passes the million-ton-per-year mark

JOHN R. SKEEN

Ammonium sulphate, consumed almost entirely in agriculture, has long been one of the most widely used of the nitrogeneous fertilizers.

Over a million tons, an increase of 70 percent over the immediate pre-war period, contributed last year especially to the production of corn, cotton and a variety of vegetables. The short supply of ammonium sulphate which has lasted for almost a decade is now nearly corrected. As of October the immediate uncertainties include the effect of the coal and steel strikes on the supply while the demand is influenced by the relatively high price of the chemical in relation to farm products.

Over 70 percent of the production of ammonium sulphate derives as a byproduct of the destructive distillation of coal. Coke oven gases containing ammonia are passed through "saturators" charged with sulphuric acid. Upon saturation, crystals of ammonium sulphate form. They are separated from the liquor by centrifugal machines and then washed and dried. About 22 lb. is obtained per ton of coal. In gas works practice, ammonia is scrubbed from the raw gas by water from which it is distilled into sulphuric acid. Since the introduction of the synthetic ammonia process, high purity crystals have been made in increasing amount by direct absorption of ammonia in the acid. The treatment of calcium cynamide with steam has also contributed to the supply while about 18 thousand tons annually are recovered from ammonia obtained as a byproduct of chemical operations.

The war created a demand for fixed nitrogen especially for military explosives while simultaneously doubling the fertilizer requirement from the 1939 level of 350 thousand tons. The expansion of the coke oven industry, completed in 1944, increased the capacity to make ammonium sulphate by 132 thousand tons or about 8 percent of the additional nitrogen needed. The deficit was provided by new anhydrous ammonia facilities. Two developments followed. The needs of the armed forces were met early in the war and it was possible to release ammonium nitrate for farm use. This was received reluctantly but today about 700 thousand tons are consumed and a new rival for ammonium sulphate as a nitrogen source has appeared. The trend in popularity continues. In 1945 the conversion of anhydrous ammonia into the sulphate increased. Thus, the plant operated at Shell Point, Calif. by Shell Chemical Co. was joined by Farm Services Co., Southern Acid and Sulphur Co., Arkansas Fertilizer Co. and ultimately eight others. This year the capacity of converters in operation is in excess of 600 thousand tons of ammonium sulphate with the possibility that three new producers will soon begin. In July 1947 the practice began of bleeding anhydrous ammonia into the lines of coke oven plants to increase the yield of the sulphate. Within a

JOHN R. SKEEN is director of market research for Foster D. Snell, Inc., New York, N. Y.

Expanding production has brought supplies into balance with demand.[1]

(Unit: 1,000 short tons)

	Production by Industry							Stocks		Foreign Trade			
		Byproduct[2]				Other Sources[3]				Imports			
	App.[3] Cons.	Total[3]	Subtotal	Coke	Gas	Subtotal	Coke	Chemical	Coke	Total[3]	Total	Canada	Exports	Price[4] $ per ton
1919			210.5	218.6	3.0						4.0			133.53
1919		267.6	274.7	280.2	5.5	32.0					2.0			93.70
1939	340		340.1	335.1	4.9						2.6		17.5	123.31
1921	300	273.8	266.3	264.3	2.0	7.5					2.5		65.0	83.08
1935	802.9		661.5	423.5	38.2				47.7	98.6	28.9	67.9	23.90
1936	914.0		800.5	556.3	43.5				88.7	171.7	53.8	118.5	25.25
1937	976.8		844.9	802.2	42.7				55.4	95.4	31.1	82.8	27.82
1938	857.8		836.9	396.4	40.5				45.4	138.3	64.2	34.4	28.70
1939	940.2		880.3	830.5	40.8				49.8	122.6	60.9	52.3	27.67
1940	991.8		718.2	670.2	42.0				44.6	47.3	45.9	104.9	28.30
1941	999.0		745.2	702.5	42.7				31.1	35.1	35.1	94.8	30.00
1942	980.0		766.8	723.7	43.1				49.7	53.3	53.2	37.5	29.71
1943	798.4		761.3	718.3	42.9				28.4	98.8	99.8	78.0	29.20
1944	946.4	901	818.2	779.1	40.1	83		83	70	69.0	103.6	108.6	10.6	29.20
1945	991.4	833.2	784.3	727.7	36.6	88.9		88.9	36	32.2	118.9	118.9	20.7	29.20
1946	971.3	900.4	643.7	610.0	33.7	156.7		156.7	41	33.4	101.6	101.2	35.3	29.45
1947	1,040.0	1,017.5	809.4	775.7	33.6	208.1	11.1	197.0	28	20.7	114.4	113.4	68.2	31.54
1948	1,065	1,049	902	830.7		226.2	30.8	195.4	31	23.9	105.9	103.9	130.7	40.57
1949														
1Q	244	220	235	216.7		65.6	12.7	52.9	30	42.2	34.9	34.8	62.0	45.00
2Q	253	308	222	214.0		85.4	11.9	73.5	60	51.8	17.8	17.8	67.3	45.00

[1] Unless otherwise stated, data obtained from *Yearbooks* and *Mineral Market Reports* of Bureau of Mines; *Facts for Industry*, series M19A and *Census of Manufactures*, Bureau of the Census; *U.S. Foreign Commerce and Navigation* and *Reports No. FT110 and 410*, Bureau of Foreign and Domestic Commerce; *Industry Report*, Office of Domestic Commerce. [2] Production plus imports less exports plus change in stocks; values 1918-21 are only approximate; 1935-43: exclusive of production and change in stocks from "other sources"—Shell and Du Pont; 1948-9: closely approximated. [3] "Other sources," unreported for so many years, preclude a complete accounting. [4] From coke oven and gas works ammonia. [5] Represented by byproduct—Rohm & Haas, Du Pont; but in late years mostly the "synthetic" made by reacting anhydrous ammonia with sulphuric acid; sub-totals 1919 and 1921 are "sales." [6] As only stocks at coke ovens are reported, values are estimations. [7] Bureau of Labor Statistics; 1918-21: reported per 100 lb. and converted; 1918-38: bulk, ex-ship, ports; 1939-45: domestic, large lots, fob. cars Atlantic ports; 1946- : fob. inland ovens.

Farmers still use most of it, but industry use is growing.[1]

(Unit: 1,000 short tons)

	Consumption[2]				
		Fertilizer			
	Total[3]	Mixed[4]	Direct[5]	Industry	% of N_2 in Fertilizers[3]
1935	540.6	304.4	116.9	11.0	42.5
1936	653.1	370.0	130.0	12.0	46.3
1937	682.5	390.5	156.4	15.0	39.3
1938	618.7	334.0	140.0	18.0	38.2
1939	625.9	339.6	159.7	20.0	37.0
1940	665.7	358.0	169.0	20.5	37.1
1941	748.4	429.0	173.6	21.0	37.8
1942	830.1	504.0	150.6	22.0	47.3
1943	854.3	583.0	147.3	23.5	36.2
1944	905.0	660.0	150.0	25.0	30.8
1945	963	658.0	.....	25.0	30.9
1946	870*	698*	100*	25*	25.8
1947	.....	637.1	168*	29*	.....
1948	1,060*	787*	200*	29*	25.4

[1] Unless otherwise specified, all data from Department of Agriculture. [2] Except where asterisked, all values courtesy A. L. Mehring, Division of Soils, Fertilizers and Irrigation, Bureau of Plant Industry, Beltsville, Md.; asterisks indicate approximations and are without official status. [3] Nitrogen content of ammonium sulphate related to total chemical nitrogen consumed as fertilizer; for latter values see *Agricultural Chemicals*, Sept. 1947, A. L. Mehring and K. C. Clark. [4] Total should approximate "apparent consumption" given in Table 1; differences accounted for by unreported production from "other sources," 1935-43, and the change in stocks in hands of dealers of fertilizers for all years; also included in consumption in Hawaii and Porto Rico not given separately in this table. [5] Fertilizer compounders. [6] Direct sales as such to farmers.

few months five plants were so operating. During the last few years, therefore, the coke oven has materially decreased in importance to the nitrogen fertilizer supply.

The history of ammonium sulphate is associated with the development of the byproduct coke oven. The first of these were simply adjunct to the Solvay soda-ammonia plant at Syracuse, N. Y. In 1893, 12 Semet-Solvay ovens were built to supply ammonia, coke and fuel to make soda ash. Two years later the Cambria Steel Co. installed Otto-Hoffman ovens at Johnstown, Pa. and the New England Coal and Coke Co. followed at Everett, Mass. These operators recovered the ammonia as the sulphate and sold it in competition with Chile saltpeter. This practice grew as the recovery ovens proved profitable with ammonium sulphate contributing the greatest byproduct income. By 1914 the steel industry and gas works made 187 thousand tons. Stimulated by war, coke ovens erected at 14 plants provided an additional capacity of nearly 110 thousand tons. At that time, it was believed that the supply was adequate for farm needs for years to come.

However, new uses for ammonia, especially for refrigeration, soon stimulated interest in the establishment of the Haber-Bosch synthetic ammonia process and the first domestic plant was erected at Syracuse by a subsidiary of Allied Chemical and Dye Corp. in 1921. The industry prospered and within 10 years such fertilizer products as urea, sodium nitrate and ammonia liquors became available. Shell appears to have been the first to use this source to make $(NH_4)_2SO_4$.

The coke oven industry remains the largest supplier. Strikes place it in a vulnerable position and encourage competition. The position of converters making anhydrous ammonia seems favorable. Besides Shell, there are now in this group Lion Oil Co. at El Dorado, Ark., and the Mathieson Chemical Co. with its plant at Lake Charles, La. Mathieson promises to be a major factor as it has recently acquired the plants of Southern Acid and Sulphur Co. at Houston, Tex., and Little Rock, Ark., (Arkansas Fertilizer Co.) as well as the Standard Wholesale Phosphate and Acid Co. at Baltimore, Md. Operators from purchased ammonia are in a less favorable position. Two have discontinued this year, Farm Services Co. of Oakland, Calif., and Columbia Metals Corp., Salem, Ore. The reluctance of fertilizer mixers to purchase at prevailing prices has caused stocks to increase rapidly and created an uncertain situation. —*End*

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Sebacic Acid $HOOC-(CH_2)_8-COOH$	98.0% min.
Ash	0.10% max.
Moisture	0.50% max.
Iodine Number	1.0 max.
Melting Point	129°C. min.
Specific Gravity 25°/15°C	1.110
APHA Color—2 grams dissolved in 50 ml. alcohol	80 max.

(C.P. grade is also available)

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DICAPRYL SEBACATE	DICAPRYL ADIPATE	DI-ISO-OCTYL PHTHALATE
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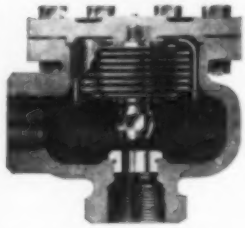

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United States Production of Certain Chemicals

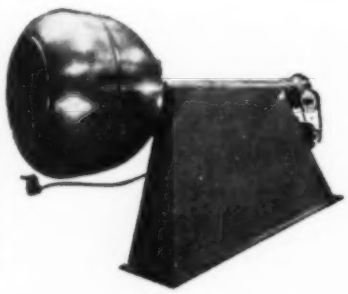
Chemical (Tons unless otherwise noted)	July 1949	July 1948	June 1949	June 1948
Ammonia, synthetic, anhydrous[1]	109,386	80,042	103,217	81,564
Ammonium nitrate	86,000	76,051	88,986	70,299
Ammonium sulphate, synthetic (M lb.)	58,930	27,586	40,188	30,134
Calcium arsenate (M lb.)	3,070	3,373	1,871	5,488
Calcium carbide, commercial	44,227	53,373	47,424	54,565
Carbon dioxide:				
Liquid and gas (M lb.)	25,709	26,731	24,771	21,388
Solid (M lb.)	104,432	92,086	91,097	82,462
Chlorine	139,163	129,445	134,572	133,231
Chrome green (M lb.)	490	1,018	761	456
Chrome yellow and orange, (C.P.) (M lb.)	2,686	3,474	2,455	4,306
Hydrochloric acid	25,978	32,982	24,933	34,930
Hydrogen (M cu. ft.)	2,047	2,148	2,035	2,207
Lead arsenate, acid and basic (M lb.)	.....	800	784	2,067
Molybdate chrome orange, (C.P.) (M lb.)	344	373	278	380
Nitric acid	90,382	92,394	97,476	81,888
Oxygen (M cu. ft.)	1,042	1,205	1,048	1,208
Phosphoric acid (80 percent H_3PO_4)	103,323	90,804	97,252	95,398
Soda ash:				
Ammonia-soda process:				
Total wet and dry[2]	289,943	308,871	309,379	347,636
Finished light[3]	144,375	202,631	152,667	178,862
Finished dense	109,026	133,921	114,015	111,130
Natural[3]	17,909	28,755	17,820	26,937
Sodium bicarbonate, refined	10,446	13,806	11,341	11,866
Sodium bichromate and chromate	4,029	7,830	4,048	7,916
Sodium hydroxide:				
Electrolytic process:				
Liquid[4]	124,634	126,720	130,566	130,498
Solid	10,916	23,984	16,594	28,097
Lime-soda process:				
Liquid[4]	39,054	67,292	32,715	60,080
Solid	9,922	21,640	11,469	19,177
Sodium phosphate:				
Monobasic	872	744	1,017	886
Dibasic	8,649	3,015	8,966	9,457
Tribasic	5,372	6,529	5,018	6,032
Meta	1,940	2,712	1,897	2,716
Tetra	6,857	4,423	5,457	4,919
Sodium silicate, anhydrous	26,446	38,230	37,658	39,093
Sodium sulphate:				
Anhydrous	7,562	12,671	8,097	13,263
Glauber's salt	7,522	13,361	8,411	15,029
Salt cake[5]	24,654	30,842	30,962	30,573
Sulphuric acid[6]:				
Chamber process	198,897	211,110	201,208	219,528
Contact process, new	578,893	571,231	897,263	867,262

Data for this tabulation have been taken from "Facts for Industry" series issued by Bureau of the Census. Production figures represent primary production and do not include purchased or transferred materials. Quantities produced by government-owned arsenals, ordnance works, and certain plants operated for the government by private industry are not included. Chemicals manufactured by TVA, however, are included. All tons are 2,000 lb. Where no figures are given data are either confidential or not yet available. [1]Includes a small amount of aqua ammonia. [2]Total wet and dry production, including quantities diverted for manufacture of caustic soda and sodium bicarbonate, and quantities processed to finished light and finished dense. [3]Not including quantities converted to finished dense. [4]Data collected in cooperation with the Bureau of Mines. [5]Figures represent total production of liquid materials, including quantities evaporated to solid caustic and reported as such. [6]Includes oleum grades, excludes spent acid. [7]Data for sulphuric acid manufactured as a byproduct of smelting operations are included.

United States Production of Synthetic Organic Chemicals

Chemical	July 1949	July 1948	June 1949	June 1948
Acetanilid	439,108	414,675	360,693	142,166
Acetic acid:				
Synthetic[1]	28,143,029	35,368,572	33,994,732	35,739,677
Recovered	86,328,077	143,504,337	81,645,202	131,205,932
Natural[2]	1,554,548	2,376,123	1,525,151	2,301,028
Acetic anhydride[3]	40,527,804	63,245,936	35,333,554	57,783,922
Acetone	25,654,618	40,232,737	32,900,526	41,097,468
Acetylsalicylic acid	.....	249,286	1,908,758	648,656

(Continued on page 272)



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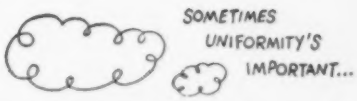

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1. Always use Ozalid sensitized materials in your Ozalid machine. Month after month, package after package, Ozalid materials are *uniform.* Printing speed, fade-resistance, physical strength, density, and eleven other characteristics are kept in scrupulous balance so that one batch of paper gives you the same results as the last one ... or the next one!

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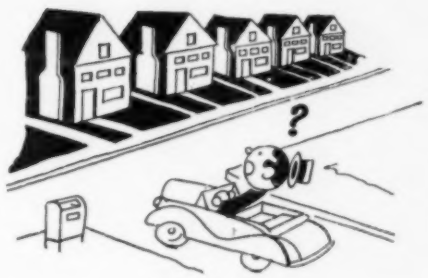

2. Ozalid's nationwide service organization is as near as your telephone book. Let these trained technicians and business wizards keep your Ozalid operation in tiptop form. They'll keep your Ozalid machine in super-efficient working condition, as well as help you set up new methods of getting more work done with less effort ... through Ozalid!

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GENERAL CONTROLS
801 ALLEN AVENUE GLENDALE 1 CALIF.

FACTORY BRANCHES AND DISTRIBUTORS IN PRINCIPAL CITIES

63-6

U. S. Production of Synthetic Organic Chemicals, cont. from page 270.

Chemical	July 1949	July 1948	June 1949	June 1948
Aniline	5,467,441	7,243,823	5,286,388	7,108,228
Barbituric acid derivatives:				
5-Ethyl-5-phenylbarbituric acid and salts (phenobarbital)	323,080	25,383	20,838	15,553
Benzene:				
Motor grade:				
Coke oven operators	1,245,715	780,567	2,633,297	757,513
All other grades:				
Tar distillers[a]	463,690	828,719	619,204	1,030,773
Coke oven operators	9,346,513	11,792,858	9,788,090	11,864,989
Butyl alcohol, primary, normal	10,669,417	11,635,000	8,496,678	9,237,429
Carbon bisulphide	27,039,702	29,528,306	27,581,173	32,791,873
Carbon tetrachloride	14,020,181	14,309,277	13,673,903	15,971,606
Chlorobenzene, mono	14,468,726	8,079,403	12,999,617	23,663,814
Creosote oil:				
Tar distillers[a]	9,017,431	8,958,149	11,057,927	7,666,515
Coke oven operators	1,824,128	2,386,709	2,164,533	2,987,008
Cresols, meta-para	342,129	868,442	331,414	735,469
Cresols, ortho-meta-para	246,402	794,139	.....	812,757
Cresylic acid, refined[7, 10]	1,336,799	2,599,285	1,927,932	2,742,977
Dibutyl phthalate	583,700	1,564,257	1,302,347	615,593
Dichlorodiphenyltrichlorethane (DDT)	3,566,986	532,680	3,125,185	355,262
Ethyl acetate (85 percent)	5,798,286	4,972,103	5,479,315	5,762,529
Ethylene glycol	38,598,453	30,140,226	37,615,980	30,741,787
Ethyl ether	2,279,543	2,563,709	3,036,203	2,979,121
Formaldehyde, 37 percent by wt.	39,468,709	43,668,213	40,262,705	45,658,213
Hexachlorocyclohexane	1,874,067	936,083	1,239,482	936,083
Methanol, natural[8]	902,947	1,417,713	970,303	1,535,078
Methanol, synthetic	50,522,985	89,691,588	46,635,525	85,519,953
Naphthalene:				
Tar distillers, less than 79° C.	8,285,555	16,433,223	9,498,082	16,927,455
Tar distillers, 79° C. and over[9]	2,339,534	8,201,504	5,138,878	8,421,981
Coke-oven operators, less than 79° C.	5,217,671	7,888,496	4,872,061	7,888,496
Penicillin and salts[6]	9,043,106	9,485,947	10,071,928	8,080,588
Phenol[3]	11,358,999	15,177,809	14,142,534	22,936,803
Phthalic anhydride	7,104,019	12,132,980	8,017,853	11,606,215
Styrene, government and private plant	28,763,246	24,939,950	28,286,193	31,005,019
Toluene:				
Coke-oven operators[9]	2,316,521	2,352,468	2,226,391	2,460,296
All other[9]	2,439,804	2,458,053	3,306,925	3,932,820
Xylene, crude	3,145,712	4,992,309	5,364,446	6,147,291

All data in pounds except benzene (gal.), creosote oil (gal.), toluene (gal.) xylene (gal.) and penicillin (million Oxford units). Statistics collected and compiled by U. S. Tariff Commission except where noted. Absence of data on production indicates either that returns were unavailable or confidential. [1]Excludes the statistics on recovered acid. [2]Acid produced by direct process from wood and from calcium acetate. [3]All acetic anhydride including that from acetic by vapor-phase process. [4]Product of distillers who use purchased coal tar only or from oil-gas or water-gas produced or purchased by tar distillers. [5]Statistics are given in terms of bulk medicinals only. [6]Statistics collected by Bureau of Mines. [7]Total production including data reported both by coke-oven operators and by distillers of purchased coal tar. [8]Reported to U. S. Bureau of the Census. [9]Includes toluene produced from petroleum by any process. [10]Includes refined cresylic acid from petroleum.

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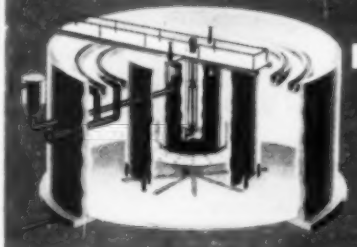

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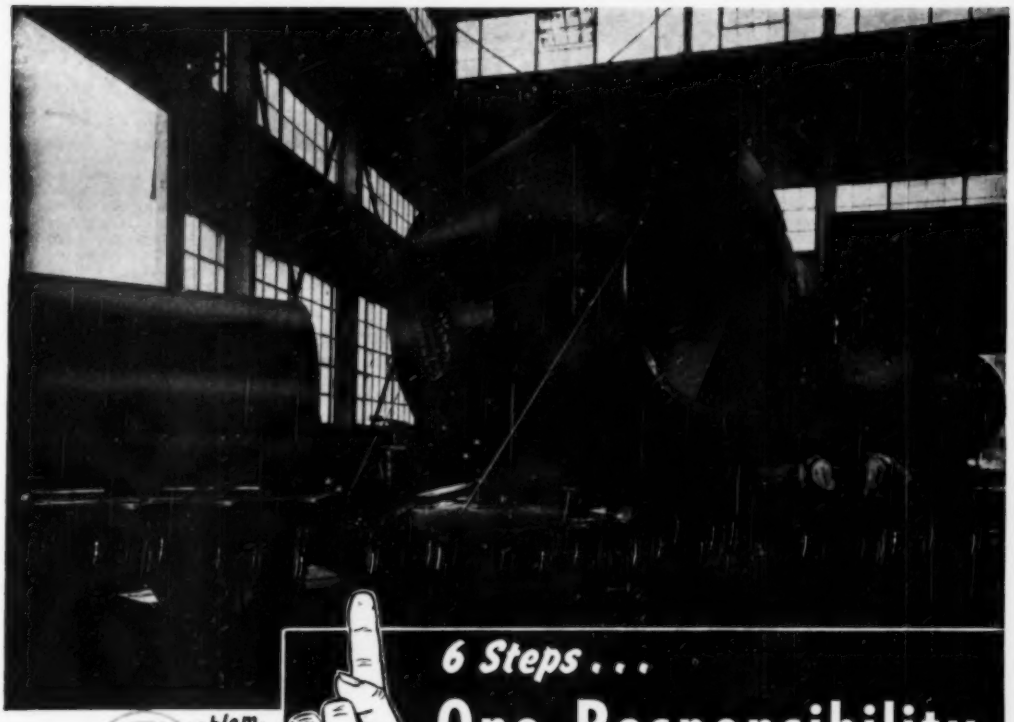

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NEW CONSTRUCTION

	Current Projects		Cumulative 1949	
	Proposed Work	Contracts	Proposed Work	Contracts
New England	.....	$109,000	$274,000	$1,637,000
Middle Atlantic	$4,250,000	1,750,000	166,203,000	16,218,000
South	2,200,000	2,450,000	11,251,000	33,872,000
Middle West	1,610,000	80,000	20,964,000	33,718,000
West of Mississippi	4,318,000	8,520,000	71,908,000	102,753,000
Far West	5,200,000	107,000	16,800,000	62,152,000
Canada	.....	520,000	30,505,000	61,423,000
Total	$17,578,000	$13,536,000	$317,905,000	$311,773,000

Proposed Work

Calif., Los Angeles—General Paint Corp., 544 Mateo St., plans the construction of a factory and warehouse to contain 70,000 sq. ft. floor space. J. M. and T. M. Cooper, 490 South San Vincente St., Archts. Estimated cost $200,000.

Fla., Tampa—Clorox Co., 850 42nd Ave., Oakland, Calif., plans to construct a plant here. Estimated cost $200,000.

Idaho, Coeur d'Alene—Idaho-Montana Pulp & Paper Co., Missoula, Mont., plans to construct a pulp mill here. Estimated cost $5,000,000.

Ind., Hammond—E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., plans to construct a 1 story, 182x222 ft. addition to its plant here. C. H. Topping, Nemours Bldg., Wilmington, Ch. Eng. Estimated cost $160,000.

La., Shreveport—Universal Oil Products Co., c/o David W. Harris, Pres., Slattery Bldg., has acquired a 600 acre tract and plans to construct a plant for the manufacture of oil specialty products. Estimated cost $1,000,000.

Mo., St. Louis—Bardahl Oil Co., 5680 Natural Bridge Ave., plans to construct a 1 story plant here containing 10,000 sq. ft. floor space, with loading docks on two railroad sidings.

Mont., Polson—Idaho-Montana Pulp & Paper Co., Polson, plans to construct a paper mill. L. A. DeGuere, Wisconsin Rapids, Wis., Eng. Estimated cost $2,500,000.

N. C. Lexington—Frank Ix & Sons, 1441 Bway., New York, N. Y., plan to construct a rayon weaving plant here. Estimated cost $1,000,000.

Ohio, Albany—Tennessee Gas & Transmission Co., Commerce Bldg., Houston, Tex., plans to construct a gas booster station here. Estimated cost $1,000,000.

O., Hamilton—American Cyanamid Corp., 30 Rockefeller Plaza, New York, N. Y., plans to construct a sulphuric acid plant here. Estimated cost $450,000.

Pa., Bristol—Rohm & Haas Co., 222 West Washington Sq., Philadelphia, manufacturer of chemicals for the textile industry, resinous products and plastics, plans to enlarge its plant here. Estimated cost $250,000.

Pa., Newton Square—Sun Oil Co., 1608 Walnut St., Philadelphia, plans to construct a Science Center here. Frederick G. Frost, Jr., 144 East 30th St., New York, N. Y., Archt. Wohlpatt & Hart, 155 East 42nd St., New York, N. Y., Engrs. Estimated cost $4,000,000.

Tex., Anson—North American Oil Consolidated and Ungren & Frazier, Anson, plan to construct a gasoline plant and gas injection system in this area. Estimated cost $1,750,000.

Contracts Awarded

Conn., Hartford—General Fireproofing Co., 130 Allyn St., has awarded the contract for a 2 story warehouse on Garden St., to Massoce Builders, Inc., Meadow Plains Rd., Simsbury, at $109,274.

Del., Dover—International Latex Corp., Dover, will construct a 2 story, 62x171 ft. plant. Work will be done by separate contracts. Estimated cost $100,000.

Fla., Port St. Joe—St. Joe Paper Co., Port St. Joe, has awarded the contract for the construction of a paper box plant to operate in connection with the St. Joe Paper Co., to The Austin Co., M & M Bldg., Houston, Tex. Estimated cost $250,000.

Fla., Panama City—Standard Oil Co. of Kentucky, 426 West Bloom St., Louisville, Ky., has awarded the contract for the construction of a lubricating oil canning and barreling plant, pumping and storage facilities and steel piers, to George D. Auchter Co., foot of East 56th St., Jacksonville. Estimated cost $500,000.

Md., Halethorpe—American Can Co., 230 Park Ave., New York, N. Y., has awarded the contract for a 1 story factory to contain 150,000 sq. ft. floor space on a 43 acre site off the Baltimore-Washington Expressway, for the manufacture of paper milk containers, to Turner Construction Co., 1500 Walnut St., Philadelphia, Pa. Estimated cost $1,500,000.

Miss., Holly Springs—Holly Springs Brick & Tile Co., c/o K. K. Knight, Holly Springs, will construct a brick plant. Work will be done by owner. Estimated cost will exceed $200,000.

Minn., Moorhead—Minnesota Farm Bureau Service Co., 101 East Fairfield Ave., St. Paul, has awarded the contract for a 6 story, 60x230 ft. fertilizer plant between 18th and 20th Sts., north of Northern Pacific tracks, to Steenberg Construction Co., 1268 First Natl. Bank Bldg., St. Paul. Estimated cost $300,000.

N. J., Vineland—Kimble Glass Div. of Owens-Illinois Glass Co., Vineland, has awarded the contract for Warehouse No. 32, 1 story, 168x168 ft., to Mahony Troast Construction Co., 1500 Walnut St., Philadelphia, Pa. Estimated cost $150,000.

O., Columbus—Capital City Products Co., 525 West First Ave., manufacturers of oleomargarine and vegetable oils, has awarded the contract for remodeling and constructing an addition to its plant to Leo E. Ruisinger, Inc., 851 Frambes Ave. Estimated cost $80,000.

Tex., Andrews—Pure Oil Co. & Associates, City Natl. Bank Bldg., Houston, have awarded the contract for a gasoline plant in Dollar Hide Field, to Hudson Engineering Co., 2711 Danville St., Houston. Estimated cost $6,000,000.

Tex., Borger—Phillips Petroleum Co., Borger, will reconstruct the aviation alkalite unit of its refinery here. Work will be done by company forces. Estimated cost $90,000.

Tex., Fort Worth—Magnolia Petroleum Co., 528 North Main St., will reconstruct portion of refinery recently damaged by a blast. Work will be done by owners. Estimated cost $90,000.

Tex., Freeport—Dow Chemical Co., Freeport, plans to rehabilitate old government magnesium plant for its own use. Contract has been awarded to Tellepson Construction Co., 1710 Telephone Rd., Houston. Estimated cost $215,000.

Tex., Houston—Cook Paint & Varnish Co., 2119 Main St., has awarded the contract for an addition to its plant to O. L. Allen, 1923 Wentworth St. Estimated cost $70,000.

Tex., Missouri City—Gulf Salt Co., Missouri City, will expand its salt mine here. Work will be done with own forces. Estimated cost $110,000.

Tex., Nordheim—Continental Oil Co., Ponca City, Okla., has awarded the contract for a gas compressor plant to Process Engineers, Inc., 5635 Daniels St., Dallas, at $270,000.

Tex., Perryton—Michigan-Wisconsin Pipe Line Co., Detroit, Mich., has awarded the contract for a compressor station to Ford, Bacon & Davis, Texas City. Estimated cost $375,000.

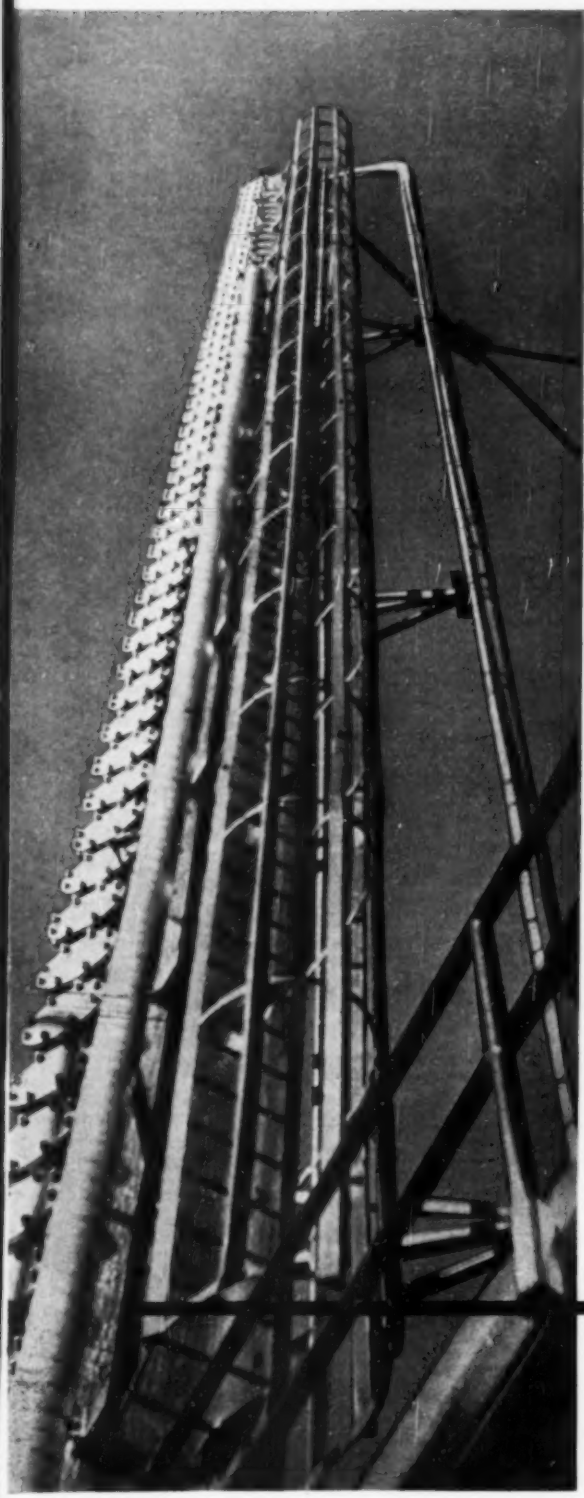
Tex., Speaks—Shell Oil Co., Shell Bldg., Houston, has awarded the contract for a recycling plant to Fluor Corp., Ltd., M. Esperson Bldg., Houston. Estimated cost $1,000,000.

Wash., Tacoma—Stauffer Chemical Co., 636 California St., San Francisco, Calif., will construct a chemical plant here using day labor. Estimated cost $107,000.

W. Va., Parkersburg—E. I. du Pont de Nemours & Co., Inc., du Pont Bldg., Wilmington, Del., will construct a 3 story addition to its plant here. Work will be done by separate contracts. Estimated cost $1,500,000.

Alta., Red Deer—East West Oil Syndicate, 10015 14th St., Edmonton, has awarded the contract for an oil refinery to Sparling Davis Co., Ltd., 7310 99th St., Edmonton. Estimated cost $150,000.

Ont., Etobicoke—Glass Art Cut China Co., 400 Carlaw Ave., Toronto, has awarded the contract for a factory to Taylor Bros., 208 Sherborne St., Toronto. Estimated cost $70,000.



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★ EXHIBITORS ★

	Space No.
Ace Glass Incorporated, Vineland, N. J.	383
Aetna Scientific Company, 2nd & Spring Sts., Everett 49, Mass.	668
Alberene Stone Corporation of Virginia, 419 Fourth Ave., New York 16, N. Y.	79
Allegheny Ludlum Steel Corporation, 532 Oliver Bldg., Pittsburgh, Pa.	250–252–254
Allen Plastics Corp., 120 S. 20 St., Irvington, N. J.	438
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Aluminum Company of America, Pittsburgh 19, Pa.	70–71
American Air Filter Co., Inc., First and Central Aves., Louisville 8, Ky.	460–461
American Balance Corporation, 48 Potter Ave., New Rochelle, N. Y.	248
American Chemical Society, 1155 Sixteenth St. N. W., Washington 6, D. C.	7 E
American Chemical Society News Service, 1155 Sixteenth St. N. W., Washington 6, D. C.	26–27
American Hard Rubber Company, 11 Mercer St., New York 13, N. Y.	303–305
American Instrument Co., Inc., 8030 Georgia Ave., Silver Spring, Md.	385–387
American Machine & Metals, Inc., Tolhurst Centrifugals Div., East Moline, Ill.	68–69
American Platinum Works, 235 N. J. R. R. Ave., Newark, N. J.	457
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American Resinous Chemicals Corporation, 103 Foster St., Peabody, Mass.	35–36
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American Tool & Machine Company, The, 1415 Hyde Park Ave., Boston, Mass.	412
American Wheelabrator & Equipment Corporation, Mishawaka, Ind.	481–482–483–484
Amersil Company, 1471 Chestnut Ave., Hillside, N. J.	454–455
Ampco Metal, Inc., 1745 S. Thirty-Eighth St., Milwaukee 4, Wisc.	268
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Andrews-Knapp Construction Co. Inc., 121 Broad St., New York 4, N. Y.	23
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Associated Cooperage Industries of America, Inc., The, 408 Olive St., St. Louis 2, Mo.	242
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Autoclave Engineers, Inc., 860 E. 19th St., Erie Pa.	701–702
Bailey Meter Company, 1050 Ivanhoe Road, Cleveland 10, Ohio	56
Baird Associates, Inc., 33 University Road, Cambridge 38, Mass.	669–670
Baker & Co., Inc., 113 Astor St., Newark 5, N. J.	451–452
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Barco Manufacturing Company, 1801 Winnemac Ave., Chicago 40, Ill.	515
Bareco Oil Company—Wax Division, P. O. Box 2099, Tulsa, Okla.	629–630
Barnstead Still & Sterilizer Co., 2 Lanesville Terrace, Forest Hills, Boston 31, Mass.	229–231
Barrett-Cravens Company, 4613 S. Western Ave., Chicago 9, Ill.	239–241
Bartlett & Snow Co., The C. O., 6200 Harvard Ave., Cleveland 5, Ohio	427–428
Beekman Industries, Inc., 420 Lexington Ave., N. Y. 17, N. Y.	439
Belco Industrial Equipment Division, Inc., 52 Iowa Ave., Paterson 3, N. J.	574
Bemis Bro. Bag Co., 408 Pine St., St. Louis 2, Mo.	338–340
Berger Manufacturing Division—Republic Steel Corporation, Canton, Ohio	434–435–436
Bird Machine Company, South Walpole, Mass.	535–536–543–544
Black, Sivalls & Bryson, Inc., 106 W. 14th St., Kansas City 6, Mo.	496
Blaw-Knox Company, Pittsburgh 30, Pa.	13–14
Blickman, Inc., S., Weehawken, N. J.	474–475
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Bowen Engineering Inc., North Branch, N. J.	400–400 A
Bowser, Inc., Fort Wayne, Ind.	461 A
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Bramley Machinery Corp., 880 River Road, Edgewater, N. J.	524–525
Brown Instruments Division—Minneapolis-Honeywell Regulator Co., Philadelphia 44, Pa.	40–41
Buffalo Apparatus Co., 90 Chenango St., Buffalo 5, N. Y.	225–227
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Builders Providence, Inc., 9 Codding St., Providence 1, R. I.	493–494–495
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Chemical Abstracts, 330 W. 42nd St., New York 18, N. Y.	26–27
Chemical and Engineering News, 330 W. 42nd St., New York 18, N. Y.	26–27
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Chemical Engineering Catalog, 330 W. 42nd St., New York 18, N. Y.	26–27
Chemical Engineering Progress, 120 E. 41st St., New York 17, N. Y.	572 A
Chemical Industries, 522 Fifth Ave., New York 18, N. Y.	28 E & 28 W
Chemical Materials Catalog, 330 W. 42nd St., New York 18, N. Y.	26–27
Chemical Process Division—Union Iron Works, Erie, Pa.	431
Chemical Processing Preview, 737 N. Michigan Ave., Chicago 11, Ill.	506
Chemicolloid Laboratories, Inc., 44 Whitehall St., New York 4, N. Y.	257
Cleveland Worm & Gear Company, The, 3249 E. 80th St., Cleveland 4, Ohio	502–503
Colton Company, Arthur, Division of Snyder Tool & Engineering Company, 3400 E. Lafayette Ave., Detroit 7, Mich.	715
Columbia Steel Company, San Francisco, Calif.	76–77
Combustion Engineering-Superheater, Inc., 200 Madison Ave., New York 16, N. Y.	266
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Conneaut Rubber and Plastics Corp., Conneaut, Ohio	89–90–91
Consolidated Engineering Corporation, 620 N. Lake Ave., Pasadena 4, Calif.	703–704
Continental Can Company, Inc., The Container Company Div., P. O. Box 310, Van Wert, Ohio	243–245
Continental Diamond Fibre Company, Newark 1, Dela.	51
Cooper Alloy Foundry Co., The, Hillside 5, N. J.	565–566
Corning Glass Works, Corning, N. Y.	391–393–395
Cowles Company, The, Cayuga, N. Y.	572 & 575
Crane Co., 836 S. Michigan Ave., Chicago 5, Ill.	297

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Crescent Rotor Pump Division, Waterous Company, St. Paul 1, Minn.	449
Croll-Reynolds Company, 17 John St., New York 7, N. Y.	505
Crucible Steel Company of America, 405 Lexington Ave., New York 17, N. Y.	635
Culvert Division—Republic Steel Corporation, Cleveland, Ohio	434–435–436
Cyclone Fence Division—American Steel & Wire Company, Waukegan, Ill.	76–77
Darco Corporation, 60 E. 42nd St., New York 17, N. Y.	46–47
Davison Chemical Corporation, The, Baltimore 3, Md.	622–623–624
Day Company, The, 810 Third Ave. N. E., Minneapolis 13, Minn.	450
Day Company, The J. H., Cincinnati 22, Ohio	718
deDietrich & Co., Niederbronn (Bas Rhin) France	512–513
DeLaval Separator Company, The, 165 Broadway, New York 6, N. Y.	323
Denver Equipment Company, 1400—17th St., P. O. Box 5268, Denver 17, Colo.	507
DeZurik Shower Co., Sartell, Minn.	723
Dicalite Division—Great Lakes Carbon Corp., 18 E. 48th St., New York 17, N. Y.	86
Dorr Company, Inc., The, 570 Lexington Ave., New York 22, N. Y.	64
Dracco Corporation, 4063 E. 116th St., Cleveland 5, Ohio	709 710
Duriron Company, Inc., The, 17 E. 42nd St., New York 17, N. Y.	19–20
Eagle-Picher Sales Company, The, 420 Lexington Ave., New York 17, N. Y.	678–679
Eastern Industries, Inc., 296 Elm St., New Haven 6, Conn.	220–222–224
Eastern Stainless Steel Corporation, Baltimore 3, Md.	573
Eclipse Fuel Engineering Co., Rockford, Ill.	504
Eco Engineering Company, 12 New York Ave., Newark 1, N. J.	641
Economic Machinery Company, Worcester 3, Mass.	545–546
Eimco Corporation, The, 634–666 South Fourth West St., Salt Lake City 8, Utah	604–605–606
Eimer and Amend, Greenwich & Morton Sts., New York 14, N. Y.	57
Electric Hotpack Company, Inc., The, Cottman Ave. at Melrose St., Philadelphia 35, Pa.	655–656
Emery Industries, Inc., Cincinnati 2, Ohio	283
Energy Control Company, Inc., 5 Beekman St., New York 7, N. Y.	722
Engelhard, Inc., Charles, 900 Passaic Ave., East Newark, N. J.	456
Enzinger Union Corporation, Angola, N. Y.	713 714
Eppenbach, Inc., 45–10 Vernon Blvd., Long Island City 1, N. Y.	278
Equipoise Controls Incorporated, 100 Stevens Ave., Mount Vernon, N. Y.	471
Eriez Manufacturing Co., Erie, Pa.	631–632
Ertel Engineering Corporation, Kingston, N. Y.	508–509
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Falstrom Company, Main Ave. & D. L. & W. R. R., Passaic, N. J.	510–511
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Farris Engineering Corporation, 374 Commercial Ave., Palisades Park, N. J.	602
Farval Corporation, The, 3249 E. 80th St., Cleveland 4, Ohio	502–503
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Filtration Engineers Incorporated, 155 Oraton St., Newark 4, N. J.	8
Fischer & Porter Company, Hatboro, Pa.	203–205–207
Fisher Scientific Company, 711 Forbes St., Pittsburgh, Pa.	57
Fitzpatrick Company, The W. J., 1001 Washington Blvd., Chicago 7, Ill.	401–402
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Food Industries, 330 W. 42nd St., New York 18, N. Y.	42
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Gamma Scientific Company, 261–263 Great Neck Road, Great Neck, N. Y.	497
Garlock Packing Company, The, Palmyra, N. Y.	244
General Alloys Company, 30 Ipswich St., Boston 15, Mass.	299
General American Transportation Corporation, 10 E. 40th St., New York 17, N. Y.	285–287
General Aniline & Film Corporation, 230 Park Ave., New York 17, N. Y.	619–620
General Ceramics and Steatite Corporation, Keasbey, N. J.	2
General Electric Company, 1 River Road, Schenectady 5, N. Y.	4
General Laboratory Supply Co., 320 Market St., Paterson 3, N. J.	711
Glascote Products, Inc., 20900 St. Clair Ave., Cleveland 17, Ohio	657–658
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Goslin-Birmingham Manufacturing Co., Inc., Birmingham 1, Ala.	74
Goulds Pumps, Inc., Seneca Falls, N. Y.	625
Great Western Manufacturing Co., Leavenworth, Kansas	372–374
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Greiner Company, The Emil, 161 Sixth Ave., New York 13, N. Y.	226–228
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Hardinge Manufacturing Company, York, Pa.	60
Hart-Moisture-Meters, 1948 Grand Central Terminal, New York 17, N. Y.	680
Hasco Valve and Machine Company, 1819 W. St. Paul Ave., Milwaukee 3, Wisc.	569
Haveg Corporation, Newark, Dela.	51
Haynes Stellite Company, 30 E. 42nd St., New York 17, N. Y.	92
Heil Process Equipment Corp., 12901 Elmwood Ave., Cleveland 11, Ohio	539
Hercules Filter Corporation, 204–208 21st Ave., Paterson 3, N. J.	443–444–445
Hercules Powder Company, Wilmington 99, Dela.	7 W
Hills-McCanna Company, 3025 Northwestern Ave., Chicago 18, Ill.	346
Hoke Incorporated, S. Dean St. at Garrett Pl., Englewood, N. J.	213
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Hormann & Co., Inc., F. R., 17 Stone St., Newark 4, N. J.	556
Illinois Electric Porcelain Co., Macomb, Ill.	672–673
Illinois Testing Laboratories, Inc., 420 N. LaSalle St., Chicago 10, Ill.	38–39
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Industrial and Engineering Chemistry, 1155 Sixteenth St. N. W., Washington 6, D. C.	26–27
Industrial Instruments, Inc., 17 Pollock Ave., Jersey City 5, N. J.	410
Industrial Steels, Inc., 246 Bent St., Cambridge 41, Mass.	649–650
Ingersoll-Rand Company, 11 Broadway, New York 4, N. Y.	615–616–617
International Nickel Company, Inc., The, 67 Wall St., New York 5, N. Y.	9–10
Interscience Publishers Inc., 215 Fourth Ave., New York 3, N. Y.	467
Jabsco Pump Company, 2031 N. Lincoln St., Burbank, Calif.	430
Jacoby, M. E., Henry E., 205 E. 42nd St., New York 17, N. Y.	540–541–542
Jacoby-Tarbox Corporation, 808 Nepperhan Ave., Yonkers 3, N. Y.	540–541–542
Jeffrey Manufacturing Co., The, Columbus, Ohio	44 A–45
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Kiefer Machine Co., The Karl, Cincinnati 2, Ohio	24
Kimble Glass—Div. of Owens-Illinois Glass Company, P. O. Box 1035, Toledo 1, Ohio	342-344
Kinney Manufacturing Co., 3529 Washington St., Boston 30, Mass.	468-469
Knapp Mills, Inc., 121 Broad St., New York 4, N. Y.	23
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Koch Engineering Company, Inc., 335 W. Lewis St., Wichita 2, Kansas	479-480
Kold-Hold Manufacturing Company, Platecoil Division, Lansing 4, Mich.	726
Koppers Company, Inc., Pittsburgh 19, Pa.	264
Koven & Brothers, Inc., L. O., 154 Ogden Ave., Jersey City 7, N. J.	304-306
Laboratory Furniture Co., Inc., 37-18 Northern Blvd., Long Island City 1, N. Y.	221-223
LaBour Company, Inc., The, Elkhart, Ind.	32
Ladish Co., Cudahy, Wisc.	613-614
Lakso Company, The, P. O. Box 257, Fitchburg, Mass.	461 B
Lapp Insulator Co., Inc., LeRoy, N. Y.	441-442
Lawrence Machine and Pump Corporation, 371 Market St., Lawrence, Mass.	663
Lead Lined Iron Pipe Company, Wakefield, Mass.	23
Lebanon Steel Foundry, Lebanon, Pa.	465-466
Leslie Co., Lyndhurst, N. J.	676-677
Link-Belt Company, 307 N. Michigan Ave., Chicago 1, Ill.	715-716-717
Louisville Drying Machinery Company Unit, General American Transportation Corporation, 139 S. Fourth St., Louisville, Ky.	285-287
Lukens Steel Company and Divisions, Coatesville, Pa.	558 to 563
Lukenweld, Inc., Coatesville, Pa.	558 to 563
Luzerne Rubber Company, Trenton 7, N. J.	528-529
Lydon Bros., Inc., 85 Jabriskie St., Hackensack, N. J.	437
McGraw-Hill Book Company, Inc., 330 W. 42nd St., New York 18, N. Y.	610
McGraw-Hill Publishing Company, 330 W. 42nd St., New York 18, N. Y.	42
M R M Company, Inc., 191 Berry St., Brooklyn 11, N. Y.	638
Macbeth Corporation, 227 W. 17th St., New York 11, N. Y.	201
Machlett & Son, E., 220 E. 23rd St., New York 10, N. Y.	381 & A. Mezz.
Maclean-Hunter Publishing Corp., 309 W. Jackson Blvd., Chicago 6, Ill.	28E & 28W
Magna Manufacturing Company, Inc., 444 Madison Ave., New York 22, N. Y.	609
Magnetrol, Inc., Division of Fred H. Schaub Engineering Co., 2110 S. Marshall Blvd., Chicago, Ill.	724
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Manton Gaulin Manufacturing Company, Inc., 44 Garden St., Everett 49, Mass.	476
Marsh Stencil Machine Co., Belleville, Ill.	411
Martindale Electric Co., The, Box 617, Edgewater Branch, Cleveland 7, Ohio	440
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Merco Centrifugal Co., 582 Market St., San Francisco 4, Calif.	448
Meriam Instrument Co., The, 10920 Madison Ave., Cleveland 2, Ohio	512-513
Metalab Equipment Corporation, 1529 Dean St., Brooklyn 13, N. Y.	462-463-464
Metal-Glass Products Co., Belding, Mich.	425-426
Metal Industries Catalog, 330 W. 42nd St., New York 18, N. Y.	26-27
Micro Metallic Corporation, 193 Bradford St., Brooklyn 7, N. Y.	671
Mine Safety Appliances Company, Braddock, Thomas & Meade Sts., Pittsburgh 8, Pa.	376-378
Minneapolis-Honeywell Regulator Co., Brown Instruments Division, Philadelphia 44, Pa.	40-41
Mixing Equipment Co., Inc., 1024 Garson Ave., Rochester 9, N. Y.	307-309-334-336
Monarch Manufacturing Works, Inc., 2501 E. Ontario St., Philadelphia 34, Pa.	354
Moore Company, J. Arthur, 342 Madison Ave., New York 17, N. Y.	512-513
Nash Engineering Company, The, South Norwalk, Conn.	16
National Carbon Company, Inc., 30 E. 42nd St., New York 17, N. Y.	30-31
National Engineering Company, 549 W. Washington Blvd., Chicago 6, Ill.	554-555
National Lead Company, 111 Broadway, New York 6, N. Y.	247
National Lead Company, Titanium Alloy Manufacturing Division, 111 Broadway, New York 6, N. Y.	366-368
National Technical Laboratories, South Pasadena, Calif.	265-267-269
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Newark Wire Cloth Company, 351 Verona Ave., Newark 4, N. J.	83-84
New England Tank & Tower Company, Everett, Mass.	50
New Jersey Machine Corporation, 16th St. & Willow Ave., Hoboken, N. J.	485-486
New York Laboratory Supply Co., Inc., 76 Varick St., New York 13, N. Y.	218
Niagara Blower Company, 405 Lexington Ave., New York 17, N. Y.	233-235
Niagara Filter Corporation, 3080 Main St., Buffalo 14, N. Y.	417-418
Niles Steel Products Division, Republic Steel Corporation, Niles, Ohio	434-435-436
Nordstrom Valve Division, Rockwell Manufacturing Company, 400 N. Lexington Ave., Pittsburgh 18, Pa.	25
Norton Company, Worcester 6, Mass.	415-416
Ohio Chemical & Mfg. Co., The, 1902 E. Johnson St., Madison 4, Wisc.	216
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Omega Machine Company, 122 S. Michigan Ave., Chicago, Ill.	493-494-495
Oronite Chemical Company, 38 Sansome St., San Francisco 4, Calif.	705
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Palmer Thermometers, Inc., Cincinnati, Ohio	512-513
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Parker Appliance Company, The, 1735 Euclid Ave., Cleveland 12, Ohio	21
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PerfeKtum Products Co., 300 Fourth Ave., New York 10, N. Y.	370
Perkin-Elmer Corporation, The, Glenbrook, Conn.	567-568
Perl-Oussani Machine Manufacturing Company, 68 Jay St., Brooklyn 1, N. Y.	644-645
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Pfaudler Co., The, 1000 West Ave., Rochester 3, N. Y.	72-73
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Philadelphia Gear Works, Inc., 6th St. below Erie Ave., Philadelphia 34, Pa.	78
Photovolt Corporation, 95 Madison Ave., New York 16, N. Y.	270-272
Pioneer Rubber Company, The, Willard, Ohio	429
Pittsburgh Corning Corporation, 307 Fourth Ave., Pittsburgh 22, Pa.	643
Pittsburgh Equitable Meter Division, Rockwell Manufacturing Company, 400 N. Lexington Ave., Pittsburgh 18, Pa.	61
Plate & Welding Division, General American Transportation Corporation, 135 S. LaSalle St., Chicago 90, Ill.	285-287
Platecoil Division of Kold-Hold Manufacturing Company, Lansing 4, Mich.	726
Pneumatic Scale Corporation, Ltd., 65 Newport Ave., North Quincy 71, Mass.	22
Popper & Klein, Inc., 300 Fourth Ave., New York 10, N. Y.	209-211
Powell Company, The Wm., 2503 Spring Grove Ave., Cincinnati 22, Ohio	54
Power Products Co., 11 Broadway, New York 4, N. Y.	537
Precision Scientific Company, 3737 W. Cortland St., Chicago 47, Ill.	701-702
Premier Mill Corporation, 218 Genesee St., Geneva, N. Y.	312-314
Pressed Steel Tank Company, W. Allis Sta., Milwaukee 14, Wisc.	348-350-352

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Process & Instruments, 60 Greenpoint Ave., Brooklyn 22, N. Y. 518
Proctor & Schwartz, Inc., 7th St. & Tabor Road, Philadelphia 20, Pa. 15
Productive Equipment Corporation, 2926 W. Lake St., Chicago 12, Ill. 549
Progressive Architecture, 330 W. 42nd St., New York 18, N. Y. 26–27
%Proportioneers, Inc.%, P. O. Box 1442, Providence 1, R. I. 477–478
Pulverizing Machinery Company, Chatham Road, Summit, N. J. 300–302
Putman Publishing Company, 737 N. Michigan Ave., Chicago 11, Ill. 506

Radio Corporation of America, Camden, N. J. 627–628
Raymond Pulverizer Division, Combustion Engineering-Superheater, Inc., 1315 N. Branch St., Chicago 22, Ill. 67
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Reeves Pulley Co. of N. Y. Inc., 76 Dey St., New York 7, N. Y. 34
Reichhold Chemicals, Inc., 601 Woodward, Heights Blvd., Detroit 20, Mich. 651–652–653–654
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Reliance Electric & Engineering Company, The, 1068 Ivanhoe Road, Cleveland 10, Ohio 674–675
Republic Lead Equipment Company, Cleveland, Ohio 89–90–91
Republic Seitz Filter Corporation, 17 Stone St., Newark 4, N. J. 557
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St. Regis Sales Corporation, Subsidiary St. Regis Paper Company, 230 Park Ave., New York 17, N. Y. 530–531–532
Saran Lined Pipe Company, 702 Stephenson Bldg, Detroit 2, Mich. 621
Sarco Company, Inc., Empire State Bldg., New York 1, N. Y. 11
Schaub Engineering Co., Fred H., Magnetrol, Inc., Division, 2110 S. Marshall Blvd., Chicago, Ill. 724
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Snyder Tool & Engineering Company, Arthur Colton Company Division, 3400 E. Lafayette Ave., Detroit 7, Mich. 719
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Taylor Forge & Pipe Works, P. O. Box 485, Chicago 90, Ill. 727–728
Technicon Chromotography Corporation, 215 E. 149th St., New York 51, N. Y. 712
Tennessee Coal, Iron & Railroad Company, Birmingham, Ala. 76–77
Thomas Company, Arthur H., P. O. Box 779, Philadelphia 5, Pa. 665 666
Titanium Alloy Manufacturing Division—National Lead Company, 111 Boadway, New York 6, N. Y. 366–368
Titeflex, Inc., 500 Frelinghuysen Ave., Newark, N. J. 633
Toledo Scale Company, Toledo 12, Ohio 44 B
Tolhurst Centrifugals Division, American Machine & Metals, Inc., East Moline, Ill. 68–69
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Troy Engine & Machine Company, 1492 Railroad Ave., Troy, Pa. 667
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Tube Turns, Inc., Louisville 1, Ky. 636–637
Turbo-Mixer Corporation, 10 E. 49th St., New York 17, N. Y. 285–287
Tyler Company, The W. S., 3615 Superior Ave., Cleveland 14, Ohio 88

Uehling Instrument Company, 473 Getty Ave., Paterson, N. J. 356
Union Bag & Paper Corporation, Woolworth Bldg., New York 7, N. Y. 490–491–492
Union Carbide and Carbon Corporation, 30 E. 42nd St., New York 17, N. Y. 17–18 & 92
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Union Iron Works, Chemical Process Division, Erie, Pa. 431
Union Process Company, 120 Ash St., Akron, Ohio 470
U. S. Electrical Motors, Inc., 200 E. Slauson Ave., Los Angeles 54, Calif. 659 A & 662 A
United States Steel Corporation, 436 Seventh Ave., Pittsburgh 30, Pa. 76–77
United States Steel Export Company, 30 Church St., New York 7, N. Y. 76–77
United States Steel Products Company, 28 Rockefeller Plaza, New York 20, N. Y. 76–77
United States Steel Supply Company, Box MM, 1301 Wabansia Ave., Chicago 90, Ill. 76–77
United States Stoneware Co., 60 E. 42nd St., New York 17, N. Y. 89–90–91
Universal Atlas Cement Company, 135 E. 42nd St., New York 17, N. Y. 76–77

VanNostrand Company, Inc., D., 250 Fourth Ave., New York 3, N. Y. 85
Victor Chemical Works, 141 W. Jackson Blvd., Chicago 4, Ill. 729 to 734
Wallace & Tiernan Co., Inc., Newark 1, N. J. 520–521

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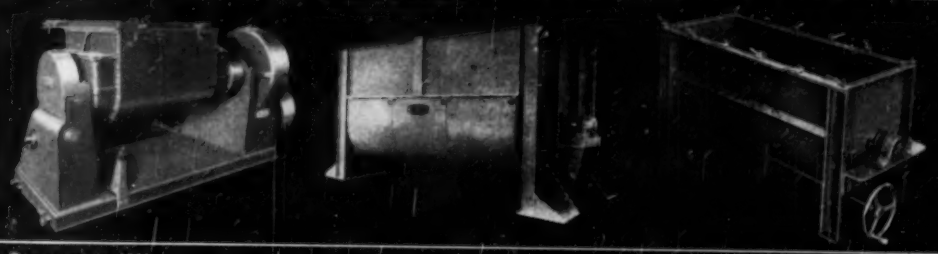

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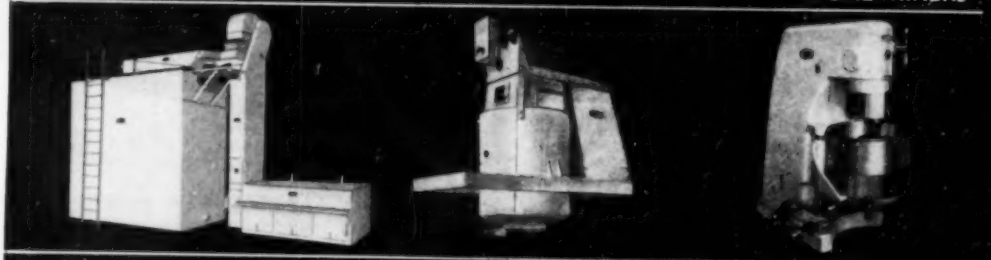

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YORK, PENNSYLVANIA

Walworth Company, South Boston, Mass. 316–318
Waterous Company, Crescent Rotor Pump Division, St. Paul 1, Minn. 449
Welch Manufacturing Company, W. M., 1515 Sedgwick St., Chicago, Ill. 405–406
Welding Engineers, Inc., Norristown, Pa. 407–408
Weston Electrical Instrument Corporation, Newark 5, N. J. 263
Whiting Corporation—Swenson Evaporator Co., Div., Harvey, Ill. 43
Wiegand Company, Edwin L., 7500 Thomas Blvd., Pittsburgh 8, Pa. 601
Wiggins Gasholder Division, General American Transportation Corporation, 135 S. LaSalle St., Chicago 90, Ill. 285–287
Wiggins Vapor Seals Division, General American Transportation Corporation, 135 S. LaSalle St., Chicago 90, Ill. 285–287
Will Corporation, Rochester 3, N. Y. 225–227
Williams Patent Crusher & Pulverizer Company, 2701 N. Broadway, St. Louis 6, Mo. 295
Willson Products, Inc., Reading, Pa. 419–420
Winthrop-Stearns Inc., 170 Varick St., New York 13, N. Y. 548
Worthington Pump and Machinery Corporation, Harrison, N. J. 319–321
York Company, Inc., Otto H., 364 Glenwood Ave., East Orange, N. J. 380

BOOTH 356

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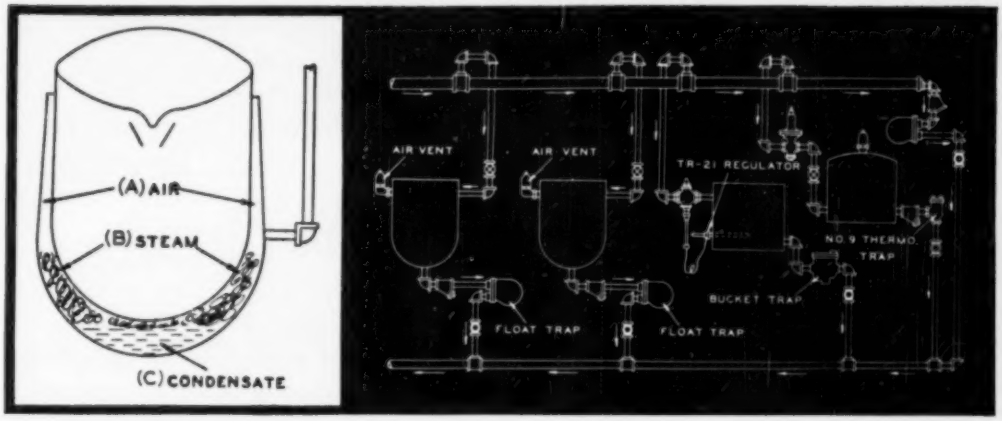

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A. Air and other gases in steam lines or equipment not only reduce the effective temperature of the steam, but create insulated cold spots wherever there is an accumulation. These gases are constantly generated in the boiler and air is always present when starting up. Ask for Bulletin No. 275 (Air in Steam).

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Guide & Directory Page 11

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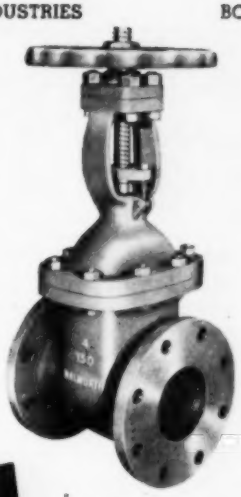

Walworth 150-pound Stainless Steel Gate Valve . . . available in sizes ½ to 3-inch, screwed; ½ to 12-inch, flanged.

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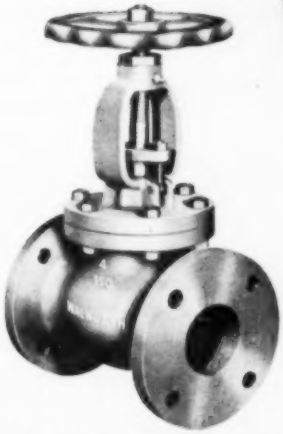

Walworth 150-pound Stainless Steel Globe Valve . . . available in sizes ½ to 3-inch, screwed; ½ to 6-inch, flanged.

Sectional view of Walworth 300-pound Stainless Steel Gate Valve . . . available in sizes 2 to 6-inch, flanged.

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For further information about Walworth's full line of corrosion-resistant valves, see your Walworth distributor.

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DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

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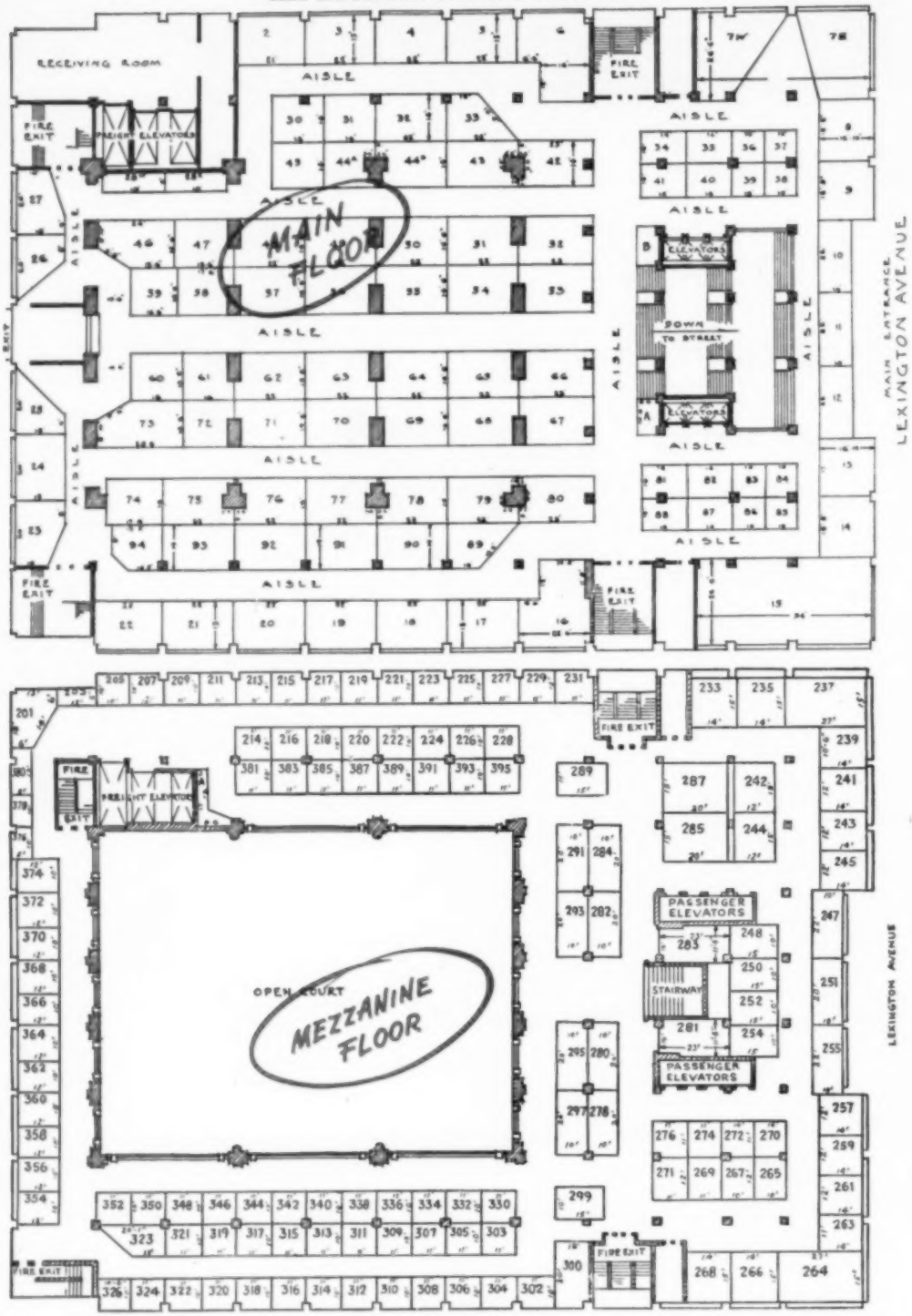
22nd EXPOSITION CHEMICAL INDUSTRIES



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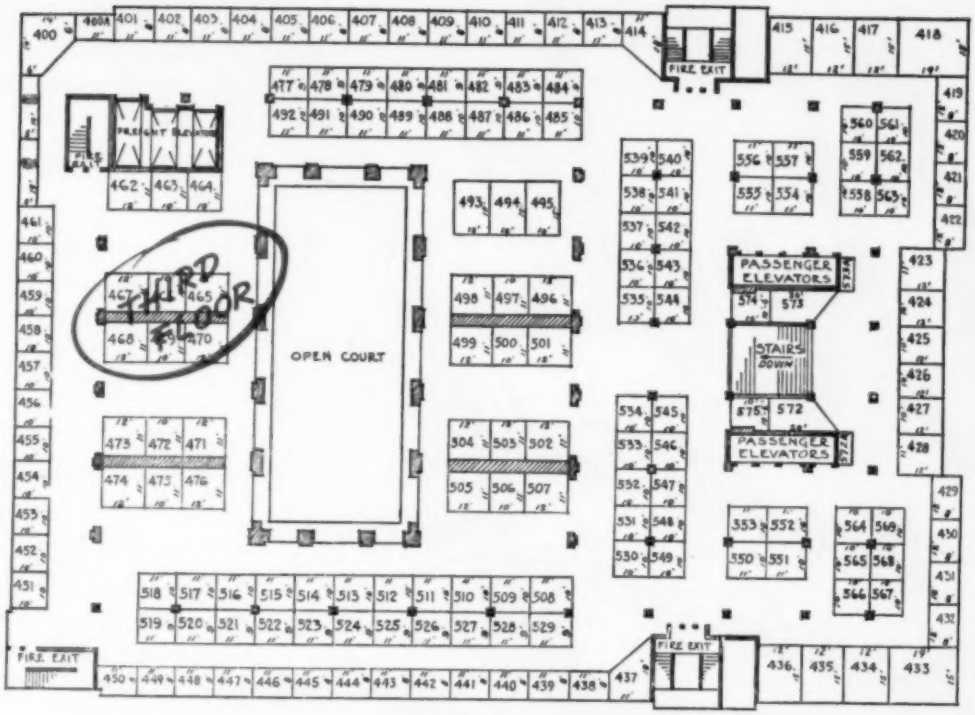

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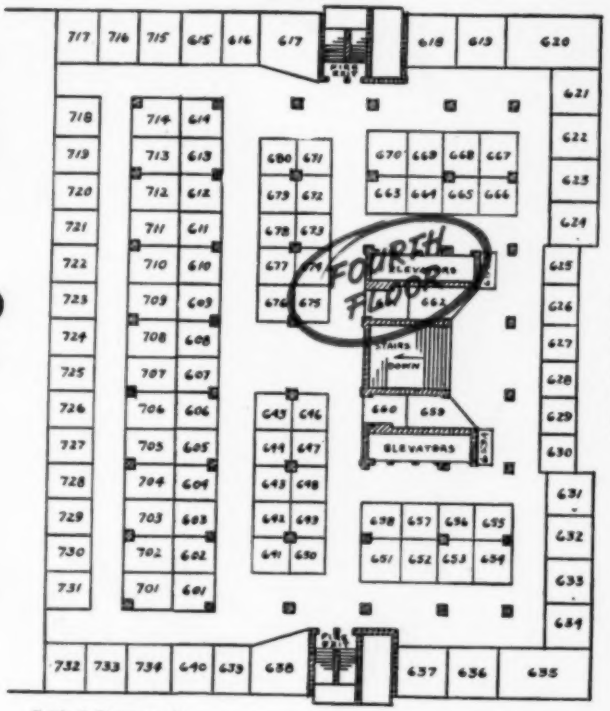

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of valuable substances to make their recovery profitable ✓

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ION EXCHANGERS • WATER CONDITIONING • MATERIALS AND EQUIPMENT

EXHIBITORS

22nd EXPOSITION CHEMICAL INDUSTRIES

CLASSIFIED BY PRODUCTS

ABRASIVES
Norton Co. (415–416)
Separations Engineering Corp. (52)
Titanium Alloy Manufacturing Div.—National Lead Co. (366–368)

ACIDS
Aluminum Co. of America (70–71)
Carbide & Carbon Chemicals Corp. (17–18 & 92)
Davison Chemical Corp., The (622–623–624)
Emery Industries, Inc. (283) Fatty
Fisher Scientific Co.—Eimer & Amend (57)
Hercules Powder Co. (7W)
Koppers Co., Inc.—Chemical Division (264)
Oronite Chemical Co. (705) Naphthenic Acids, Cresylic Acids
Pfizer & Co., Inc., Charles (5)
Victor Chemical Works (729 to 734)
Will Corp. (225–227)

ACIDIFIERS
Day Co., The J. H. (718)
General Ceramics & Steatite Corp. (2)
Haveg Corp. (51)

ACID PLANTS
Amersil Co., Inc. (454–455)
Fansteel Metallurgical Corp. (282–284)
Haveg Corp. (51)
Knapp Mills, Inc.—Andrew Knapp Construction Co. (23) Lead Lined Iron Pipe Co.
Knight, Maurice A. (53)
National Carbon Co., Inc. (30–31)
National Lead Co. (247)
Patterson Foundry & Machine Co. (707–708)
U. S. Stoneware Co., The (89–91)

ACID RESISTING MATERIALS
Alberene Stone Corp. of Virginia (79)
American Hard Rubber Co. (303–305) Hard Rubber & Plastics
American Resinous Chemicals Corp. (35–36)
Amersil Co., Inc. (454–455)
Ampco Metal, Inc. (268)
Austenal Laboratories, Inc. (573A)
Burgess-Parr Co. (661)
Cooper Alloy Foundry Co., The (565–566) Stainless Steel, Nickel & Monel
Duriron Co., Inc., The (19–20)
Fansteel Metallurgical Corp. (282–284)
General Ceramics & Steatite Corp. (2)
Glascote Products, Inc. (657–658)
Haveg Corp. (51)
Haynes Stellite Co. (92)
Heil Process Equipment Corp. (539)
Illinois Electric Porcelain Co. (672–673)
Johns-Manville (93–94)
Knapp Mills, Inc.—Andrews-Knapp Construction Co. (23)
Knight, Maurice A. (53)
Lapp Insulator Co., Inc. (441–442)
Lead Lined Iron Pipe Co. (23)
Luzerne Rubber Co., The (528–529) Hard Rubber
National Carbon Co., Inc. (30–31)
National Lead Co. (247)
St. Regis Sales Corp. (530–532)
Saran Lined Pipe Co. (621)
U. S. Steel Corp. (76–77)
U. S. Stoneware Co., The (89–91)
Allegheny Ludlum Steel Corp. (250–254)
Lukens Steel Co. & Divisions—By-Products Steel Co. & Lukenweld (558–563) Clad Steels

ADHESIVES
American Polymer Corp. (35–36)
American Resinous Chemicals Corp. (35–36)
Carbide & Carbon Chemicals Corp. (17–18 & 92)
General Aniline & Film Corp. (619–620)
Koppers Co., Inc., Chemical Division (264)
Reichhold Chemicals, Inc. (651–654)
U. S. Stoneware Co., The (89–91)

AGITATORS
Alsop Engineering Co. (293)
Blaw-Knox Co. (13–14)
Blickman Inc. S. (474–475)
Buflovak Equipment Div.—Blaw-Knox Co. (6)
Denver Equipment Co. (507)
Dorr Co., Inc., The (64)
Eastern Industries, Inc. (220–222–224) Chemical, Propeller Type, Portable, Side Entering, Top Entering
Eppenbach, Inc. (278)
Ertel Engineering Corp. (508–509)
General Alloys Co. (299)
General American Transportation Corp. (285–287)
General Ceramics & Steatite Corp. (2)
General Laboratory Supply Co. (711)
Glascote Products, Inc. (657–658)
Gump Co., B. F. (362–364)
Hardinge Co., Incorporated (60)
Haveg Corp. (51)
Haynes Stellite Co. (92)
Hercules Filter Corp. (443–445)
Knapp Mills, Inc.—Andrews-Knapp Construction Co. (23)
Koven & Brother, L. O. (304–306)
Lead Lined Iron Pipe Co. (23)
Machlett & Son, E. (381 & A)
Metal Glass Products Co., Inc. (425–426) Stainless
Mixing Equipment Co., Inc. (307–309 & 334–336)
National Lead Co. (247)
New England Tank & Tower Co. (50)
Patterson Foundry & Machine Co. (707–708)
Pfaudler Co., The (72–73)
Plate & Welding Div. General American Transportation Corp. (285–287)
Read Machinery Div.—The Standard Stoker Co., Inc. (280)
Rietz Manufacturing Co. (648)
Rodgers Co., George D. (612)
Schutte & Koerting Co. (291) Jet
Sprout, Waldron & Co., Inc. (550–553)
Turbo-Mixer Corp. (285–287)
Union Iron Works (431) Chemical Process Div.
U. S. Stoneware Co., The (89–91)
Will Corp. (225–227)
Cowles Co., Inc., The (572–575)
Premier Mill Corp. (312–314)
Tri-Homo Corp. (626)

AIR CONDITIONING APPARATUS
American Instrument Co., Inc. (385–387)
General Electric Apparatus Dept. (4)
Niagara Blower Co. (233–235)

ALCOHOL
Bowser, Inc. (461A)
Carbide & Carbon Chemicals Corp. (17–18 & 92)
Commercial Solvents Corp. (55)
Fisher Scientific Co.—Eimer & Amend (57)

ALKALIES
Foote Mineral Co., Inc. (607–608)

ALLOYS FERROUS
Austenal Laboratories, Inc. (573A)
Burgess-Parr Co. (661)
Cooper Alloy Foundry Co., The (565–566) Stainless Steel, Nickel, Monel
Duriron Co., Inc., The (19–20)
General Alloys Co. (299)
Haynes Stellite Co. (92)
Industrial Steels, Inc. (649–650)
Republic Steel Corp. (434–436)
Titanium Alloy Manufacturing Div.—National Lead Co. (366–368)
Allegheny Ludlum Steel Corp. (250–254)
Lukens Steel Co. Div.—By-Products Steel Co.—Lukenweld (558–563)
Makepeace Co., D. E. (453)
Crucible Steel Co. of America (635)
U. S. Steel Corp. (76–77)

ALLOYS NON-FERROUS
Aluminum Co. of America (70–71)
American Platinum Works, The (457)
Ampco Metal, Inc. (268)
Austenal Laboratories, Inc. (573A)
Burgess-Parr Co. (661)
Crucible Steel Co. of America (635)
Fansteel Metallurgical Corp. (282–284)
Haynes Stellite Co. (92)
International Nickel Co., Inc., The (9–10)
Knapp Mills, Inc.—Andrews-Knapp Construction Co. (23)
Lead Lined Iron Pipe Co. (23)
Makepeace Co., D. E. (453)
National Lead Co. (247)
Titanium Alloy Manufacturing Div.—National Lead Co. (366–368)

ANODES
Aluminum Co. of America (70–71)
American Platinum Works (457)
Baker & Co., Inc. (451–452)
Duriron Co., Inc., The (19–20)
Heil Process Equipment Corp. (539) Lead
Knapp Mills, Inc.—Andrews-Knapp Construction Co. (23)
Lead Lined Iron Pipe Co. (23)
National Carbon Co., Inc. (30–31)
National Lead Co. (247)
U. S. Stoneware Co., The (89–91)

ASBESTOS
Risher Scientific Co.,—Eimer & Amend (57)
Haveg Corp. (51)
Hercules Filter Corp. (443–445)
Johns-Manville (93–94)
Republic Seltz Filter Corp. (557)

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EXHIBITORS • Classified by Products

AUTOCLAVES
Ace Glass, Incorporated (383)
Aloe Company, A. S. (720)
American Instrument Co., Inc. (385–387)
Barnstead Still & Steriliner Co. (229–231)
Bartlett & Snow Company, C. O. (427–428)
Blickman Inc., S. (474–475)
Buflovak Equipment Div.—Blaw-Knox Co. (6)
Combustion Engrg.—Superheater, Inc. (266)
Fisher Scientific Co.—Eimer & Amend (57)
Glascote Products, Inc. (657–658)
Jerguson Gage & Valve Co. (514)
Knapp Mills, Inc.—Andrews-Knapp Construction Co. (23)
Koven & Brother, Inc., L. O. (304–306)
Lead Lined Iron Pipe Co. (23)
Machlett & Son, E. (381 & A)
National Lead Co. (247)
Patterson Foundry & Machine Co. (707–708)
Pfaudler Co., The (72–73)
Popper & Klein, Inc. (209–211 & 370)
Precision Scientific (701–702)
Union Iron Works (431)
Welch Manufacturing Co., W. M. (405–406)
Will Corp. (225–227)
Blaw-Knox Co. (13–14)

AUTOMATIC TEMPERATURE CONTROL
American Instrument Co., Inc. (385–387)
Bailey Meter Co. (56) Air Operated-Electrically Operated
Bowser, Inc. (461A)
Eclipse Fuel Engineering Co. (504)
Electric Hotpack Co., Inc., The (655–656)
Energy Control Co., Inc. (722)
Fenwal Incorporated (603)
Greiner Co., The Emil (226–228)
Illinois Testing Laboratories, Inc. 38–39)
Minneapolis-Honeywell Regulator Co. —Brown Instruments Div. (40–41) Non-Indicating, Indicating, Recording—Pneumatic & Electric
Precision Scientific Co. (701–702)
Rockwell Co., W. S. (447)
Rosevear Co., M. B. (602) Controls Temperature
Sarco Co., Inc. (11)
Wiegand Co., Edwin L. (601)
Will Corp. (225–227)
Leslie Co. (676–677)

BAGS
Bemis Bro. Bag Co. (338–340)
Fulton Bag & Cotton Mills (424)
St. Regis Sales Corp. (530–532)
Union Bag & Paper Corp. (490–492)

BALANCES AND WEIGHTS
Aloe Co., A. S. (720)
American Balance Co. (248)
Exact Weight Scale Co., The (472–473)
Fisher Scientific Co.—Eimer & Amend (57)
Gamma Scientific Co. (497)
General Laboratory Supply Co. (711)
Greiner Co., The Emil (226–228) Analytical
Machlett & Son, E. (381 & A)
New York Laboratory Supply Co., Inc. (218)
Palo-Myers, Inc. (642)
Seedered-Kohlbusch, Inc. (389)
Standard Scientific Supply Corp. (618)
Thomas Co., Arthur H. (665–666)
Toledo Scale Co. (44B)
Welch Manufacturing Co., W. M. (405–406)
Will Corp. (225–227)

BARRELS, DRUMS, KEGS
Aluminum Co. of America (70–71)
American Hard Rubber Co. (303–305) Rubber Lined
Associated Cooperage Industries of America, Inc., The (242)
Bowser, Inc. (461A)
Carpenter Container Corp. (261)
Continental Can Co., Inc.—Fibre Drum Section—(243–245) Fibre Drums
Greif Bros., The—Cooperage Corp. (261) Carpenter Container Corp.
Industrial Steels, Inc. (649–650)
Koven & Brother, Inc., L. O. (304–306)
Pressed Steel Tank Co. (348–352)
Republic Steel Corp. (434–436) Steel
Metal Glass Products Co., Inc. (425–426) Stainless Steel
U. S. Steel Corp. (76–77)

BASKETS, DIPPING
American Hard Rubber Co. (303–305) Hard Rubber
General Ceramics & Steatite Corp. (2)
Haveg Corp. (51)
Haynes Stellite Co. (92)
Heil Process Equipment Corp. (539)
Koven & Brother, Inc. L. O. (304–306)
Luzerne Rubber Co., The (528–529) Hard Rubber
Tyler Co., The, W. S. (88)
U. S. Stoneware Co., The (89–91)

BEARINGS
Ampco Metal, Inc. (268)
Great Western Manufacturing Co. (372–374)
Jeffrey Manufacturing Co., The (44A-45) Shaft
Link-Belt Co. (715–717)
National Lead Co. (247)
Reeves Pulley Co. (34)

BELTS
Allis-Chalmers Manufacturing Co. (48–49)
Garlock Packing Co., The (244)
Great Western Manufacturing Co. (372–374)
Reeves Pulley Co. (34)

BLAST EQUIPMENT-SAND
American Wheelbrator & Equipment Corp. (481–484)
Titanium Alloy Manufacturing Div.—National Lead Co. (366–368)

BLOWERS (KIND)
Day Co., The (450) Industrial Exhausters
Duriron Co., Inc., The (19–20) Acid Resisting
Eclipse Fuel Engineering Co. (504) Centrifugal
General Ceramics & Steatite Corp. (2) Stoneware
Ingersoll-Rand Co. (615–617) Turbo
Martindale Electric Co. (440) Portable
Niagara Blower Co. (233–235) Ventilating Fans
Read Machinery Div. of The Standard Stoker Co., Inc. (280) Positive Displacement
Schutte & Koerting Co. (291) Jet

BOILERS
Combustion Engrs.—Superheater, Inc. (266)
Eclipse Fuel Engineering Co. (504)
Fansteel Metallurgical Corp. (283-284)
Rosevear Co., M. B. (602)
Union Iron Works (431)

BOILER COVERING & INSULATION
Dicalite Div., Great Lakes Carbon Corp. (86)
Johns-Manville (93–94)
Pittsburgh Corning Corp. (643)

BOLTING CLOTH
Great Western Manufacturing Co. (372–374)
Gump Co., B. F. (362–364)
Newark Wire Cloth Co. (83–84)
Patterson Foundry & Machine Co.
Richmond Mfg. Co. (519 to 521) (707–708)
Tyler Co., The W. S. (88)

BOOKS
Interscience Publishers, Inc. (467)
McGraw-Hill Book Co., Inc. (610)
McGraw-Hill Publishing Co. (42)
Putnam Publishing Co. (506)
Reinhold Publishing Corp. (26–27)
Van Nostrand Co., Inc., D. (85)

BOTTLING MACHINERY
Chase Equipment Co. (547)
Economic Machinery Co. (545–546)
Ertel Engineering Corp. (508–509)
Horix Manufacturing Co. (413–414)
Kiefer Machine Co., The Karl (24)
M R M Co., Inc. (638)
New Jersey Machine Corp. (485–486)
Perl Oussani Machine Manufacturing Co. (644–645)
Pneumatic Scale Corp., Ltd. (22)

BRICK, ACID PROOF
Haveg Corp. (51)
Heil Process Equipment Corp. (539)
Illinois Electric Porcelain Co. (672–673)
Knight, Maurice A. (53)
Lapp Insulator Co., Inc. (441–442)
National Carbon Co., Inc. (30–31)
Patterson Foundry & Machine Co. (707–708)
U. S. Stoneware Co., The (89–91)

BRICK, INSULATING
Illinois Electric Porcelain Co. (672–673)
Johns-Manville (93–94)
Norton Co. (415–416)
Titanium Alloy Manufacturing Div.—National Lead Co. (366–368)

BRICK, REFRACTRY
Johns-Manville (93–94)
Norton Co. (415–416)
Titanium Alloy Manufacturing Div.—National Lead Co. (366–368)
U. S. Stoneware Co., The (89–91)

BRIQUETTING & TABLET MAKING MACHINERY
Carver Inc., Fred S. (237)
Rietz Manufacturing Co. (648)

BUCKETS, ELEVATOR
Bartlett & Snow Co., C. O. (427–428)
Eimco Corp., The (604–606)
Great Western Manufacturing Co. (372–374)
Gump Co., B. F. (362–364)
Jeffrey Manufacturing Co., The (44A-45)
Link-Belt Co. (715–717)
National Engineering Co. (554–555)
Read Machinery Div. of The Standard Stoker Co., Inc. (280)

BUILDING MATERIALS
Aluminum Co. of America (70–71)
Johns-Manville
Owens-Illinois Glass Co., Kaylo Division (281)
U. S. Steel Corp. (76–77)

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EXHIBITORS • Classified by Products

BURNERS
Aloe Co., A. S. (720)
Combustion Engrg., Superheater, Inc. (266)
Eclipse Fuel Engineering Co. (504)
Hanovia Chemical Manufacturing Co. (458–459) Heating Arcs
Machlett & Son, E. (381 & A)
Rockwell Co., W. S. (447)
Schutte & Koerting Co. (291) Oil-Industrial
Selas Corp. of America (533–534) Gas
Welch Manufacturing Co., W. M. (405–406)
Will Corp. (225-227) Laboratory

CABINETS—CHEMICAL, FILING AND LABORATORY
Alberene Stone Corp. of Virginia (79) Laboratory
American Instrument Co., Inc. (385–387)
Blickman Inc., S. (474–475)
Falstrom Co., (510–511)
Fisher Scientific Co.—Eimer & Amend (57)
Gamma Scientific Co. (497)
Kewanee Manufacturing Co. (308–310) Chemical, Filing, Laboratory
Laboratory Furniture Co., Inc. (221–223) Chemical, Laboratory
Precision Scientific Co. (701–702)
Republic Steel Corp. (434–436) Filing
Sheldon & Co., E. H. (255) Chemical, Laboratory
Sjostrom Co., John E. (664) Chemical, Filing, Laboratory
Welch Manufacturing Co., W. M. (405–406)

CALCINERS
Bartlett & Snow Co., C. O. (427–428)
Dorr Co., Inc., The (64)
General American Transportation Corp. (285–287)
Koven & Brother, Inc., L. O. (304–306)
Plate & Welding Div.—General American Transportation Corp. (285–287)

CALORIMETERS
Aloe Co., A. S. (720)
Machlett & Son, E. (381 & A)
Palo-Myers, Inc. (642)
Precision Scientific Co. (701–702)
Scientific Glass Apparatus Co., Inc. (215 to 219)
Thomas Co., Arthur H. (665–666)
Welch Manufacturing Co., W. M. (405–406)
Will Corp. (225–227)

CANS
Aluminum Co. of America (70–71)
Blickman Inc., S. 474–475)
Continental Can Co., Inc.—Fiber Drum Section (243–245)
Falstrom Co. (510–511)
Greif Bros., The—Cooperage Corp.—Carpenter Container Corp. (261)
Koven & Brother, Inc., L. O. (304–306)
Will Corp. (225–227)

CARBON
Darco Corp. (46–47) Activated
General Ceramics & Steatite Corp. (2)
National Carbon Co., Inc. (30–31)

CARBOY TILTERS
Aloe Co., A. S. (720)
Barrett-Cravens Co. (239–241)
Electric Hotpack Co., Inc., The (655–656)
Machlett & Son, E (381 & A)
Will Corp. (225–227)

CARS, FREIGHT
Tank Car Div.—General American Transportation Corp. (285–287)

CARS, TANK
American Hard Rubber Co. (303–305) Rubber Linings for
General American Transportation Corp. (285–287) Tank Car Division—Tank—Freight—Trans—Flo, Cars

CASTINGS (KIND)
Allis-Chalmers Manufacturing Co. (48–49) Precision
Aluminum Co. of America (70–71)
Ampco Metal, Inc. (268) Sand, Centrifugal, Cast to Size
Austenal Laboratories, Inc. (573A) Precision Investment
Buflovak Equipment Div.—Blaw-Knox Co. (6) Grey Iron
Burgess-Parr Co. (661) Alloy
Cooper Alloy Foundry Co., The (565–566) Stainless Steel, Nickel, Monel
Duriron Co., Inc., The (19–20) Acid Resisting
Eimco Corp., The (604 to 606)
General Alloys Co. (299) Stainless Steel, Heat Resistant
Goslin-Birmingham Manufacturing Co., Inc. (74)
Hardinge Co., Incorporated (60) Grey Iron
Hills-McCanna Co. (346) Magnesium
Illinois Electric Porcelain Co. (672–673) Porcelain
Industrial Steels, Inc. (649–650)
International Nickel Co., Inc., The (9–10) Sand, Centrifugal, Precision
Lebanon Steel Foundry (465–466) Stainless—Corrosion—Heat Resistant—Alloys. Carbon & Low Structural Alloys, & Centri-Die Castings
Link-Belt Co. (715–717) Malleable Iron & Steel
National Lead Co. (247) Lead & Tin Alloys
Sprout, Waldron & Co., Inc. (550 to 553) Iron & White Iron
Allegheny Ludlum Steel Corp. (250 to 254) Stainless Steel
Crucible Steel Co. of America (635) Sand & Precision

CAUSTIC POTS
Blaw-Knox (13–14)
Buflovak Equipment Div.—Blaw-Knox Co. (6)
Goslin-Birmingham Manufacturing Co., Inc. (74)
Patterson Foundry & Machine Co. (707–708)

CELLULOSE
Hercules Filter Corp. (443 to 445)
Hercules Powder Co. (7W) & Cellulose Derivatives

CEMENT (KIND)
Haveg Corp. (51) Acid Proof
Johns-Manville (93–94) Insulating & Refractory
Knight, Maurice A. (53) Acid Proof
National Carbon Co., Inc. (30–31) Corrosion Resistant
Norton Co. (415–416) Refractory
Patterson Foundry & Machine Co. (707–708) Acid Proof
Titanium Alloy Manufacturing Div.—National Lead Co. (366–368) Refractory
U. S. Steel Corp. (76–77) General
U. S. Stoneware Co., The (89 to 91) Acid & Alkali Resistant

CENTRIFUGALS
Aloe Co., A. S. (720)
American Tool & Machine Co. (412)
Baker Perkins, Inc. (62–63)
Bird Machine Co. (535–536 & 543–544)
DeLaval Separator Co. (323)
Denver Equipment Co. (507)
Fisher Scientific Co.—Eimer & Amend (57)
Fletcher Works, Inc. (33) Direct Motor Driven Suspended V-Belt Suspended—Belt Driven Suspended Open Top—Bottom Discharge — Laboratory — Variable Speed
General Laboratory Supply Co. (711)
Machlett & Son, E. (381 & A)
Merco Centrifugal Co. (448) Continuous
Precision Scientific Co. (701–702)
Sharples Corp. (58–59)
Thomas Co., Arthur H. (665–666)
Welch Manufacturing Co., W. M. (405–406)
Will Corp. (225–227) Laboratory

CERAMICS
General Ceramics & Steatite Corp. (2)
Great Western Manufacturing Co. (372–374)
Illinois Electric Porcelain Co. (672–673)
Knight, Maurice A. (53)
Lapp Insulator Co., Inc. (441–442)
Patterson Foundry & Machine Co. (707-708)
Selas Corp. of America (533–534) Special
Titanium Alloy Manufacturing Div.—National Lead Co. (366–368)
U. S. Stoneware Co., The (89 to 91)

CHEMICAL STONEWARE, ACID PROOF
Fisher Scientific Co.—Eimer & Amend (57)
General Ceramics & Steatite Corp. (2)
Illinois Electric Porcelain Co. (672–673)
Kewanee Mfg. Co. (308–310)
Knight, Maurice, A. (53)
Laboratory Furniture Co., Inc. (221–223)
Machlett & Son, E. (381 & A)
Monarch Manufacturing Works, Inc. (354)
U. S. Stoneware Co., The (89 to 91)

CHEMICALS, INDUSTRIAL
Aluminum Co. of America (70–71)
Alrose Chemical Co. (489)
Ansul Chemical Co. (81–82)
Atlas Powder Co. (46–47)
Carbide & Carbon Chemicals Corp. (17–18 & 92)
Chemical Industries (28E & 28W)
Commercial Solvents Corp. (55)
Davison Chemical Corp., The (622 to 624)
Emery Industries, Inc. (283)
Foote Mineral Co., Inc. (607–608) Lithium Chemicals — Strontium Chemicals—Manganese Chemicals—Tungsten Chemicals
General Aniline & Film Corp. (619–620) Dyestuffs
Hercules Powder Co. (7W) Paper Chemicals-Insecticides
Koppers Co., Inc.—Chemical Div. (264)
*Oronite Chemical Co. (705)
Pfizer & Co., Chas. (5)
Reichhold Chemicals, Inc. (651 to 654)
Titanium Alloy Manufacturing Div.—National Lead Co. (366-368)
Victor Chemical Works (729 to 734)
Winthrop-Stearns Inc. Special Chemicals Div. (548)
Socony-Vacuum Oil Co., Inc., (324–326)

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EXHIBITORS • Classified by Products • CONTINUED

Bowser, Inc. (461A)
U. S. Steel Corp. (76–77)
*Oronite Chemical Co. (705) Lube Oil Additives, Gas Odorants, Phthalic Anhydride, Polybutenes, Wetting Agents, Sodium Sulfonates

CHEMICALS, LABORATORY

Aloe Co., A. S. (720
American Resinous Chemicals Corp. (35–36)
Atlas Powder Co. (46–47)
Carbide & Carbon Chemicals Corp. (17–19 & 92)
Chemical Industries (28E & 28W)

CHEMICAL PLANT EQUIPMENT

Aluminum Co., of America (70–71)
American Hard Rubber Co. (303–305) Corrosion Resistant, of Hard Rubber & Plastics
Amersil Co., Inc. (454–455)
Artisan Metal Products, Inc. (540 to 542) Henry E. Jacoby
Austenal Laboratories, Inc. (573A)
Baker Perkins, Inc. (62–63)
Belco Industrial Equipment Div., Inc. (574)
Blickman Inc., S. (474–475)
Bowen Engineering, Inc. (400–400A)
Buflovak Equipment Div.—Blaw-Knox Co. (6)
Carver, Fred S. Inc. (237)
Colton Co., Arthur (719)
Corning Glass Works (391 to 395) Glass
Day Co., The (450) Stainless Steel Fabricating
Day Co., The J. H. (718)
Denver Equipment Co. (507)
Dorr Co., Inc., The (64)
Duriron Co., Inc., The (19–20)
Eppenbach, Inc. (278)
Ertel Engineering Corp. (508-509)
Falstrom Co. (510-511)
Fansteel Metallurgical Corp. (282–284)
Fitzpatrick Co., The W. J. (401–402)
General American Transportation Corp. (285-287)
General Ceramics & Steatite Corp. (2)
General Electric Apparatus Dept. (4)
Glascote Products, Inc. (657–658)
Goslin-Birmingham Manufacturing Co., Inc. (74)
Gump Co., B. F. (362–364)
Hardinge Company Incorporated (60)
Haveg Corp. (51)
Heil Process Equipment Corp. (539)
Hercules Filter Corp. (443 to 445)
Illinois Electric Porcelain Co. (672 673)
Illinois Water Treatment Co. (611)
Industrial Steels, Inc. (649–650) Supplies
Ingersoll-Rand Co. (615 to 617)
Knapp Mills, Inc. — Andrew-Knapp Construction Co. (23)
Knight, Maurice A. (53)
Koch Engineering Co., Inc. (479–480) Plants & Equipment
Koven & Brother, Inc., L. O. (304–306)
LaBour Co., Inc., The (32) Pumps
Lapp Insulator Co., Inc. (441–442) Porcelain
Lawrence Machine & Pump Corp. (663)
Lead Lined Iron Pipe Co. (23)
Link-Belt Co. (715 to 717)
Luzerne Rubber Co., The (528–529) Hard Rubber
M R M Co., Inc. (638)
Magnetrol, Inc. (724)
Micro Metallic Corp. (671)
Mixing Equipment Co., Inc. (307–309) (334–336)
Monarch Manufacturing Works, Inc. (354)
Moore Co., J. Arthur (512–513)
National Carbon Co., Inc. (30–31)
National Engineering Co. (554–555)
National Lead Co. (247)
Newark Wire Cloth Co. (83–84)
New England Tank & Tower Co. (50)
Omega Machine Co. (493 to 495)
Niagara Filter Corp. (417-418)
Patterson Machine & Foundry Co. (707–708)
Patterson-Kelley Co., Inc. (274–276)
Pfaudler Co., The (72–73)
Pressed Steel Tank Co. (348 to 352)
Read Machinery Div. of The Standard Stoker Co., Inc. (280)
Richardson Scale Co. (659–660)
Rietz Manufacturing Co. (648)
Rockwell Co., W. S. (447)
Rodgers Co., George G. (612)
Rosevear Co., M. B. (602)
Roy Co., Milton (432–433)
Schneible Co., Claude B. (421–422)
Schutte & Koerting Co. (291)
Seederer-Kohlbusch, Inc. (389)
Separations Engineering Corp. (52)
Sprout, Waldron & Co., Inc. (550 to 553)
Sturtevant Mill Co. (3)
Swenson Evaporator Co.—Div. of Whiting Corp. (45)
Synthron Co. (311–313)
Tri-Clover Machine Co. (498)
Tyler Co., The W. S. (88)
Union Iron Works (431)
U. S. Stoneware Co. (89 to 91)
Wallace & Tiernan Co., Inc., (519 to 521)
Welding Engineers, Inc. (407–408)
Ampco Metal, Inc. (268)
Blaw-Knox Co. (13–14)
Bramley Machine Corp. (524–525)
Premier Mill Corp. (312–314)
Republic Seitz Filter Corp. (557)
Stokes Machine Co., F. J. (80)
Ertel Engineering Corp. (508–509)
Fisher Scientific Co.—Eimer & Amend (57)
General Laboratory Supply Co. (711)
Knapp Mills, Inc. — Andrews-Knapp Construction Co. (23)
Lead Lined Iron Pipe Co. (23)
Machlett & Son, E. (381 & A)
Matheson Co., Inc., The (271) Organic
New York Laboratory Supply Co., Inc. (218)
Palo-Myers, Inc. (642)
Pfizer & Co., Inc., Chas. (5)
Scientific Glass Apparatus, Inc. (215 to 219)
Standard Scientific Supply Corp. (618)
Thomas Co., Arthur H. (665–666)
Welch Manufacturing Co., W. M. (405–406)
Will Corp. (225–227)
Winthrop-Stearns Inc.—Special Chemicals Div. (548)
Bartlett & Snow Co., The C. O. (427–428)
Platecoil Div. Kold-Hold Mfg. Co. (726)
Richmond Mfg. Co. (519)
Troy Engine & Machine Co. (667)

CHEMICALS, PHARMACEUTICAL

Atlas Powder Co. (46–47)
Carbide & Carbon Chemicals Corp. (17–18 & 92)
Chemical Industries (28E & 28W)
Foote Mineral Co., Inc. (607–608) Lithium
Pfizer & Co., Inc., Chas. (5)
Winthrop-Stearns Inc.—Special Chemicals Div. (548)

CHEMISTS

Pfizer & Co., Inc., Chas. (5)
Process & Instrument (518)
Spell Inc., Foster D (37) Analytical, Paint, Varnish, Bacteriological, Industrial, Rubber, Plastics

CHLORINATORS

Builders-Providence (493-495)
Fischer & Porter Co. (203 to 207)
Glascote Products, Inc. (657–658)
Haveg Corp. (51)
Knapp Mills, Inc.—Andrews-Knapp Construction Co. (23)
Lapp Insulator Co., Inc. (441–442)
Lead Lined Pipe (Iron) Co. (23)
Permutit Co., The (403–404)
Pfaudler Co., The (72–73)
Proportioneers, Inc. (477–478)
Wallace & Tiernan Co., Inc. (519 to 521)
Blaw-Knox Co. (13–14)

CLARIFIERS

American Tool & Machine Co. (412)
Bird Machine Co. (535–536 & 543–544)
DeLaval Separator Co. (323)
Denver Equipment Co. (507)
Dorr Co., Inc., The (64)
Fletcher Works, Inc. (33)
General American Transportation Corp. (285–287)
Hardinge Company Incorporated (60)
Hercules Filter Corp. (443 to 445)
Link-Belt Co. (715 to 717)
Merco Centrifugal Co. (448)
Niagara Filter Corp. (417–418)
Oliver United Filters, Inc. (66)
Plate & Welding Div. General American Transportation Corp. (285–287)
Permutit Co., The (403–404)
Tolhurst Centrifugals Div.—American Machine & Metals, Inc. (68–69)
Republic Seitz Filter Corp. (557)

CLASSIFIERS

Bird Machine Co. (535–536 & 543–544)
Denver Equipment Co. (507)
Dorr C., Inc., The (64)
Hardinge Company Incorporated (60)
Link-Belt Co. (715–717)
Merco Centrifugal Co. (448)
Richmond Mfg. Co. (519)
Separations Engineering Corp. (52)

CLUTCHES

Hardinge Company Incorporated (60)
Jeffrey Manufacturing Co., The (44A-45)
Link-Belt Co. (715 to 717)

COAL TAR OILS

U. S. Steel Corp. (76–77)

COATING—PROTECTIVE

American Resinous Chemicals Corp. (35–36)
Atlas Powder Co. (46–47)
Heil Process Equipment Corp. (539) Acid & Alkali Resistant
Johns-Manville (93–94)
Knight, Maurice A. (53)
National Lead Co. (247)
Saran Lined Pipe Co. (621)
U. S. Stoneware Co., The (89 to 91)
Davison Chemical Corp., The (622 to 624)
Lukens Steel Co. Div.—By-Products Steel Co.—Lukenweld (558 to 563)
Tri-Homo Corp. (626)

COILS

Crane Co. (297)
Heil Process Equipment Corp. (539) Carbon, Lead Monel & Stainless
Platecoil Div. Kold-Hold Mfg. Co. (726)

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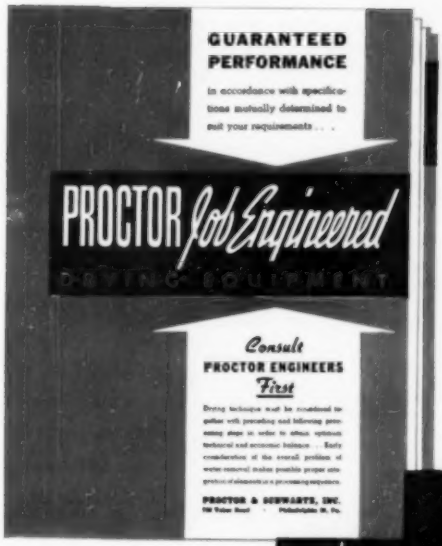
Proctor job engineered drying equipment means guaranteed performance



Because of the extensive research and study that precede the recommendation of any Proctor drying system—it is possible for Proctor engineers to guarantee in writing in the sales contract, the performance of that equipment. Always the system is installed under Proctor direction—and must be performing according to contract stipulations before Proctor & Schwartz consider the installation complete. Guaranteed performance means absolute satisfaction. For the story of how Proctor engineers approach a drying problem and an outline of some of the basic types of Proctor equipment for the chemical process industries, write for Bulletin 342—just off the press.

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Introduction
2 Fundamental explanation of drying
3 How guaranteed performance works
4 Preforming and continuous conveyor drying
5 More on continuous conveyor drying
6 Case histories and typical installations
7 Narrow conveyor dryer; variable circulation laboratory dryer
8 Highlights on other Proctor dryers and summary

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EXHIBITORS • Classified by Products • CONTINUED

Knapp Mills, Inc.—Andrews-Knapp Construction Co. (23)
Lead Lined Iron Pipe Co. (23)
Schutte & Koerting Co. (291) Radiafin

COLLECTORS

American Wheelbrator & Equipment Corp. (481 to 484) Dust
Day Co., The (450) Dust
Pangborn Corp., (75)
Pulverizing Machinery Co. (300–302)
Schneible Co., Claude B. (421–422) Dust, Fume, Vapors
Technicon Chromatography Corp. (712)

COLLOID MILLS

Bartlett & Snow Co., The C. O. (427–428)
Chemicolloid Laboratories, Inc. (257)
Eppenbach, Inc. (278)
Fitzpatrick Co., The W. J. (401–402)
Machlett & Son, E. (381 & A)
Manton Gaulin Manufacturing Co., Inc. (476)
Palo-Myers, Inc. (642)
Patterson Foundry & Machine Co. (707–708)
Will Corp. (225–227)
Tri-Homo Corp. (626)
Premier Mill Corp. (312–314)
Troy Engine & Machine Co. (667)
Union Process Co. (470)

COLORIMETERS

Aloe Co., A. S. (720)
American Instrument Co., Inc. (385–387)
Gamma Scientific Co. (497)
Macbeth Corp. (201)
Machlett & Son, E. (381 & A)
National Technical Laboratories (265 to 269)
New York Laboratory Supply Co., Inc. (218)
Palo-Myers, Inc. (642)
Photovolt Corp. (270–272)
Radio Corp. of America—Scientific Instruments Section (627–628)
Scientific Glass Apparatus Co., Inc. (215 to 219)
Standard Scientific Supply Corp. (618)
Thomas Co., Arthur H. (665–666)
Welch Manufacturing Co., W. M. (405–406)
Weston Electrical Instrument Corp. (263)
Will Corp. (225–227)

COLORS, DRY

Reichhold Chemicals, Inc. (651 to 654)

COMPARATORS

Aloe Co., A. S. (720)
Gamma Scientific Co. (497)
General Laboratory Supply Co. (711)
Machlett & Son, E. (381 & A)
New York Laboratory Supply Co., Inc. (218)
Wallace & Tiernan Co., Inc. (519 to 521)
Will Corp. (225–227)

COMPRESSORS

Fuller Co. (315–317)
General Ceramics & Steatite Corp. (2) Stoneware
Ingersoll-Rand Co. (615 to 617)
Selas Corp. of America (533–534) Gas

CONCENTRATORS

Buflovak Equipment Div.—Blaw-Knox Co. (6)
Denver Equipment Co. (507)
Fansteel Metallurgical Corp. (282–284)
General Ceramics & Steatite Corp. (2)
Goslin-Birmingham Manufacturing Co., Inc. (74)
Hardinge Company Incorporated (60)
Haveg Corp. (51)
Knapp Mills, Inc. — Andrews-Knapp Construction Co. (23) Lead Lined Iron Pipe Co.
Knight, Maurice A. (53)
Merco Centrifugal Co. (448)
National Lead Co. (247)
Patterson Foundry & Machine Co (707–708)
Patterson-Kelley Co., Inc. (274–276)
Pfaudler Co., The (72–73)
Separations Engineering Corp. (52)

CONDENSERS

Allis-Chalmers Manufacturing Co. (48–49)
Aluminum Co. of America (70–71)
Artisan Metal Products, Inc. (540 to 542) Henry E. Jacoby
Blaw-Knox Co. (13–14)
Blickman Inc., S. (474–475)
Croll-Reynolds Co. (505)
Fansteel Metallurgical Corp. (282–284)
General American Transportation Corp. (285–287)
General Ceramics & Steatite Corp. (2)
Glascote Products, Inc. (657–658)
Goslin-Birmingham Manufacturing Co., Inc. (74)
Haveg Corp. (51)
Ingersoll-Rand Co. (615–617)
Knapp Mills, Inc. — Andrews-Knapp Construction Co. (23)
Knight, Maurice A. (53)
Koven & Brother, Inc. L. O. (304–306)
Lead Lined Iron Pipe Co. (23)
Machlett & Son, E. (381 & A)
Moore Co., J. Arthur (512–513) Glass Lined
Niagara Blower Co. (233–235)
Patterson Foundry & Machine Co. (707–708)
Patterson-Kelley Co., Inc. (274–276)
Pfaudler Co., The (72–73)
Plate & Welding Div.—General American Transportation Corp. (285–287)
Schutte & Koerting Co. (291) Jet & Tubular
Union Iron Works (431)
Welch Manufacturing Co., W. M. (450–406)

CONSERVATION STRUCTURES

General American Transportation Corp.

CONTACTORS

Allis-Chalmers Manufacturing Co. (48–49)
Knight, Maurice A. (53)
Koch Engineering Co., Inc. (479–480)
York Co., Inc., Otto H. (380) Wire Mesh

CONTAINERS

Aluminum Co., of America (70–71)
Associated Cooperage Industries of America, Inc., The (242)
Continental Can Co., Inc.—Fibre Drum Section (243–245)
General Ceramics & Steatite Corp. (2)
Greif Bros., The—Cooperage Corp.—Carpenter Container Corp. (261)
Haveg Corp. (51)
Luzerne Rubber Co., The (528–529) Hard Rubber
Metal Glass Products, Co., Inc., (425–426) Stainless Steel
Pfaudler Co., The (72–73)
Pressed Steel Tank Co. (348 to 352)
Republic Steel Corp. (434 to 436)
St. Regis Sales Corp. (530–532)
Union Bag & Paper Corp. (490 to 492)

CONTROL APPARATUS

American Instrument Co., Inc. (385–387)
Builders-Providence, Inc. (493 to 495)
Burling Instrument Co. (409) Temperature
Consolidated Engineering Corp. (703–704)
Energy Control Co., Inc. (722)
Fischer & Porter Co. (203 to 207)
General Electric Apparatus Dept. (4)
Industrial Instruments, Inc. (410)
Lapp Insulator Co., Inc. (441–442)
Macbeth Corp. (201)
Machlett & Son, E. (381 & A)
Magnetrol, Inc. (724)
National Technical Laboratories (265 to 269)
Omega Machine Co. (493–495)
Precision Scientific Co. (701–702)
Process & Instrument (518)
%Proportioneers, Inc.% (477–478) Batch Control
Reeves Pulley Co. (34)
Richardson Scale Co. (659–660)
Rosevear Co., N. B. (602)
Sarco Co., Inc. (11)
Seederer-Kohlbusch, Inc. (389)
Superior Electric Co., The (522–523)
Toledo Scale Co. (44B)
Wallace & Tiernan Co., Inc. (519 to 521)
Will Corp. (225–227)

CONTROLLER (KIND)

Allis-Chalmers Manufacturing Co. (48–49) Electric
Bailey Meter Co. (56) Air Operator for Pressure, Flow, Level, Temperature & other factors. Electrically Operated for Pressure, Flow, Level, Temperature & other factors.
Builders-Providence, Inc. (493 to 495) Rate of Flow
Burling Instrument Co. (409) Temperature
Consolidated Engineering Corp. (703–704)
Fenwal Incorporated (603) Temperature
Fischer & Porter Co. (203 to 207) Flow Rate & Liquid Level
Greiner Co., The Emil (226–228) Pressure
Magnetrol, Inc. (724) Liquid Level
Minneapolis-Honeywell Regulator Co. —Brown Instrument Div. (40–41) Non-Indicating Temperature, Pressure, Humidity, Pneumatic & Electric Indicating Recording-Temperature, Pressure, Humidity, Flow, Liquid Level, & pH-Pneumatic & Electric
Rosevear Co., M. B. (602) Temperature
Sarco Co., Inc. (11) Temperature
Selas Corp. of America (533–534) Combustion
Superior Electric Co., The (522–523)
Uehling Instrument Co. (356) Liquid Level, High Alarm Switch, Low Alarm Switch
Wallace & Tiernan Co., Inc. (519 to 521) Flow
Welch Manufacturing Co., W. M. (405–406)
Weston Electrical Instrument Corp. (263) Recording & Indicating

CONVEYING MACHINERY AND EQUIPMENT

Ampco Metal, Inc. (268)
Barrett-Cravens Co. (239–241)
Bartlett & Snow Co., The C. O. (427–428)
Colton Co., Arthur (719)

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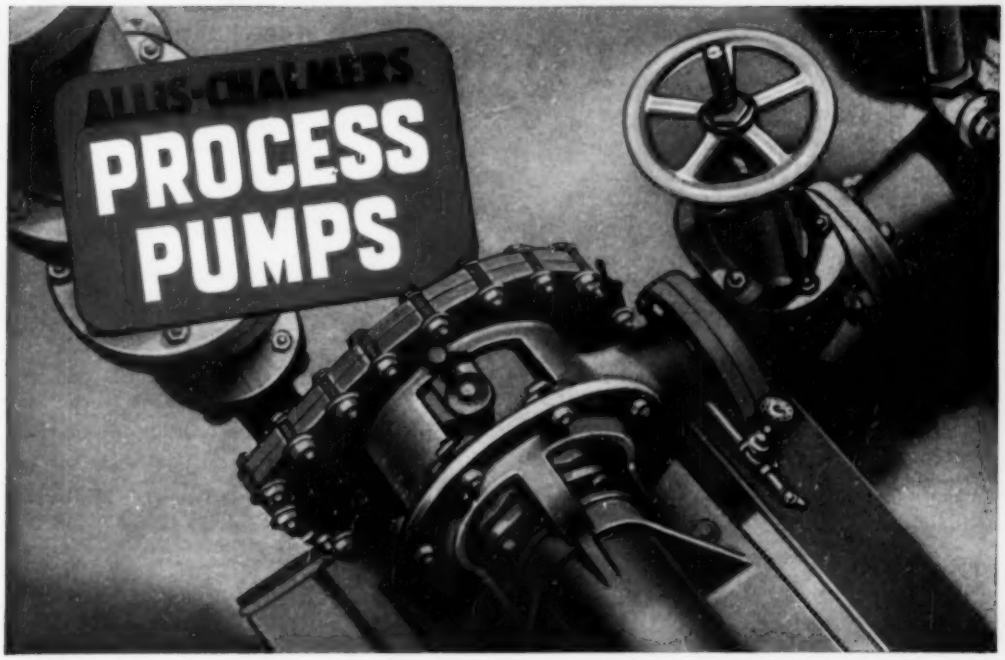

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ON ABRASIVE LIQUOR PUMP!"

SUPERINTENDENT of a midwestern processing plant says: "We pump tailings and filter solutions. Our conventional pumps required parts replacement every 6 to 10 weeks. We have *not replaced any parts* in our A-C process pumps *in 20 months*. We are replacing all our conventional pumps with A-C process pumps."

Plant after plant reports similar experiences. A-C process pumps are designed and built stronger especially to stand up under the added wear of suspended abrasives, mild corrosives or both. Such features as stuffing box on suction side . . . double volute casing . . . extra thick sections . . . closed impeller . . . separated wearing parts . . . and adjustable clearance between impeller and wearing plate give you added life and amazingly lower maintenance costs.

STOCKED IN 4 MATERIALS

Shipment from stock on complete pumps and all parts in aluminum-bronze, Ni-resist, 18% chrome steel and 316 stainless steel. You need not carry spare parts inventory. For complete information, see your A-C Authorized Dealer or Sales Office or write for Bulletin 08B6615. A-2737

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MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.

ALLIS-CHALMERS

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EXHIBITORS • Classified by Products • CONTINUED

Day Co., The (450) Pneumatic
Day Co., The J. H. (718)
Denver Equipment Co. (507)
Dracco Corp. (709-710)
Fuller Co. (315–317)
Great Western Manufacturing Co. (372–374)
Gump Co., B. F. (362–364)
Hardinge Company Incorporated (60)
Horix Manufacturing Co. (413–414)
Jeffrey Manufacturing Co., The (44A-45)
Koven & Brother, Inc., L. O. (304–306)
Link-Belt Co. (715 to 717)
M R M Co., Inc. (638)
National Engineering Co. (554–555)
Perl-Oussani Machine Manufacturing Co. (644–645)
Read Machinery Div. of The Standard Stoker Co., Inc. (280)
Richardson Scale Co. (659–660)
Simplicity Engineering Co. (706)
Sprout, Waldron & Co., Inc. (550 to 553)
Syntron Co. (311–313)
U. S. Steel Corp. (76–77)

COOLERS

Aluminum Co. of America (70–71)
American Hard Rubber Co. (303–305) Chlorine
American Instrument Co., Inc. (385–387) Circulating
Amersil Co., Inc. (454–455) Acid
Bartlett & Snow Co., The C. O. (427–428) Rotary
Buflovak Equipment Div.—Blaw-Knox Co. (6)
Chemicolloid Laboratories, Inc. (257)
Fuller Co. (315–317)
General American Transportation Corp. (285–287)
General Ceramics & Steatite Corp. (2)
Hardinge Company, Incorporated (60)
Haveg Corp. (51)
Jeffrey Manufacturing Co., The (44A-45)
Knight, Maurice A. (53)
Link-Belt Co. (715 to 717)
Louisville Drying Machinery Co., Unit of (285–287) Rotary Water General American Transportation Corp. Tube Coolers
Niagara Blower Co. (233–235)
Patterson-Kelley Co., Inc. (274–276)
Pfaudler Co., The (72–73)
Plate & Welding Div.—General American Transportation Corp. (285–287)
Reitz Manufacturing Co. (648)
Schutte & Koerting Co. (291) Oil, Water, etc.
Patterson Foundry & Machine Corp., The (707–708)

COOPERAGE

Aluminum Co. of America (70–71)
Associated Cooperage Industries of America, Inc., The (242)
Pfaudler Co., The (72–73)
Pressed Steel Tank Co. (348 to 352)

COUPLINGS

Aluminum Co. of America (70–71)
Cooper Alloy Foundry Co., The (565–566) Stainless Steel, Nickel Monel
Crane Co. (297)
Fischer & Porter Co. (203 to 207) Metal-to-Glass & Glass-to-Glass
Great Western Manufacturing Co. (372–374)
Jeffrey Manufacturing Co., The (44A-45)
Link-Belt Co. (715 to 717)
Philadelphia Gear Works (78) Shaft
Tri-Clover Machine Co. (498)
Walworth Co. (316–318) Pipe

CRUCIBLES

Ace Glass, Incorporated (383)
Aloe Co., A. S. (720)
Amersil Co., Inc. (454–455)
General Laboratory Supply Co. (711)
Machlett & Son, E. (381 & A)
Norton Co. (415–416)
Baker & Co., Inc. (451–452) Platinum
Selas Corp. of America (533–534) Filter
Thomas Co., Arthur H. (665–666)
Titanium Alloy Manufacturing Div.—National Lead Co. (366–368)
Will Corp. (225–227)

CRUSHERS, GRINDING MILLS AND PULVERIZERS

Allis-Chalmers Manufacturing Co. (48-49)
Bartlett & Snow Co., the C. O. (427–428) Rotary
Combustion Engineering—Superheater Inc. — (67) Raymond Pulverizer Division
Denver Equipment Co. (507)
Eppenbach, Inc. (278)
Fisher Scientific Co.—Eimer & Amend (57)
Fitzpatrick Co., The W. J. (401–402)
Hardinge Company Incorporated (60) Grinding Mills & Pulverizers
Jeffrey Manufacturing Co., The (44A-45)
Link-Belt Co. (715 to 717)
Machlett & Son, E. (381 & A)
Tri-Homo Corp. (626)
Patterson Foundry & Machine Co. (707–708)
Pulverizing Machinery Co. (300–302)
Reitz Manufacturing Co. (648)
Sprout, Waldron & Co., Inc. (550 to 553)
Sturtevant Mill Co. (3)
Thomas Co., Arthur H. (665–666)
Union Process Co. (470)
Will Corp. (225–227)
Williams Patent Crusher & Pulverizer Co. (295)
Combustion Engrg., Superheater, Inc. (266)

CRYSTALLIZING EQUIPMENT

Buflovak Equipment Div.—Blaw-Knox Co. (6)
General American Transportation Corp. (285–287)
Goslin-Birmingham Manufacturing Co., Inc. (74)
Haveg Corp. (51)
Knapp Mills, Inc.—Andrews-Knapp Construction Co. Lead Lined Iron Pipe Co. (23)
Koven & Brother, Inc., L. O. (304–306)
Machlett & Son, E. (381 & A)
Patterson Foundry & Machine Co. (707–708) Pebble, Ball, Tube, Rod
Pfaudler Co., The (72-73)
Swenson Evaporator Co.—Div. of Whiting Corp. (43)
Welding Engineers, Inc. (407–408)

CYLINDERS FOR HIGH PRESSURE GASES

Hoke Incorporated (213)
Pressed Steel Tank Co. (348 to 352) Also Cylinders for Low Pressure Gas
U. S. Steel Corp. (76–77)

CO2 RECORDERS

Baird Associates, Inc. (669–670)
Cambridge Instrument Co., Inc. (330–332)
Energy Control Co. Inc. (722)
Machlett & Son, E. (381 & A)
Mine Safety Appliance Co. (376–378)
Permutit Co., The (403–404)
Uehling Instrument Co. (356)
Cambridge Instrument Co., Inc. (330–332)

DECOLORIZATION & PURIFYING MATERIALS

Aluminum Co. of America (70–71)
Darco Corp. (46–47)
Dicalite Div. Great Lakes Carbon Corp. (86)

DETERGENTS

Alrose Chemical Co. (489)
Atlas Powder Co. (46–47)
Carbide & Carbon Chemicals Corp. (17–18 & 92)
General Aniline & Film Corp. (619–620)
Snell Inc., Foster D. (37) Testing
Standard Scientific Supply Corp. (618)
Victor Chemical Works (729 to 734)
Oronite Chemical Co. (705)

DIGESTERS

Blaw-Knox Co. (13–14)
Buflovak Equipment Div.—Blaw-Knox Co. (6)
Combustion Engrg. Superheater Inc. (266)
General American Transportation Corp. (285–287)
Hardinge Company Incorporated (60)
Haveg Corp. (51)
Knapp Mills, Inc.—Andrews-Knapp Construction Co. (23) Lead Lined Iron Pipe Co.
Koven & Brother, Inc., L. O. (304–306)
Patterson-Kelley Co., Inc. (274–276)
Pfaudler Co., The (72–73)
Plate & Welding Div. General American Transportation Corp. (285–287)
Lukens Steel Co. Div.—By-Products Steel Co.—Lukenweld (558 to 563) Pulp

DISSOLVERS

Allis-Chalmers Manufacturing Co. (48-49)
Baker Perkins, Inc. (62–63)
Haveg Corp. (51)
Combustion Engrg., Superheater, Inc. (266)
Koven & Brother, Inc., L. O. (304–306)
New England Tank & Tower Co. (50)
Patterson-Kelley Co., Inc. (274–276)
Pfaudler Co., The (72–73)
Rietz Manufacturing Co. (648)
Cowles Co., Inc., The (572 & 575)

DISTILLING MACHINERY & APPARATUS

Ace Glass, Incorporated (383)
Aloe Co., A. S. (720)
Aluminum Co. of America (70–71)
Artisan Metal Products, Inc. (540 to 542) Henry E. Jacoby
Austenal Laboratories, Inc. (573A)
Barnstead Still & Sterilizer Co. (229–231)
Buflovak Equipment Div.—Blaw-Knox Co. (6)
Electric Hotpack Co., Inc., The (655–656)
Great Western Manufacturing Co. (372–374)
Koch Engineering Co., Inc. (479–480) Machinery & Apparatus
M R M Co., Inc. (638)
Machlett & Son, E. (381 & A)
Palo-Myers, Inc. (642)
Patterson Foundry & Machine Co., The (707–708)
Pfaudler Co. The (72–73)
Scientific Glass Apparatus Co., Inc. (215 to 219)
Stokes Machine Co., F. J. (80)
Technicon Chromatography Corp. (712)
Will Corp. (225–227)

DRIVES

Allis-Chalmers Manufacturing Co. (48-49)

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See These New Units at the Chemical Exposition Grand Central Palace, Booths 432-433

The "Titronic" Pump and Milton Roy Automatic Concentration Control System make possible, for the first time, the continuous titration and concentration control of all caustic or acid baths. Bath strengths can be maintained within very close limits, under all conditions.

The "Constametric" Pump is a positive displacement precision metering unit. Two plungers, cam driven, are so designed that flow (discharge) is constant, free from pulsation. For use where slug feeding is objectionable, for metering liquids in minute quantities, for pilot plant operations, certain high pressure applications and others.

"Airometric" Air-cylinder Powered Pumps will be demonstrated for the first time. Mechanical, electrical or combination electrical-mechanical controls for air powered pumps will be shown.

If you can't make the "Chem. Show" write for literature. Or ask for engineering recommendations on specific applications.

MILTON Roy COMPANY

1322 E. MERMAID LANE, CHESTNUT HILL, PHILA. 18, PA.

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EXHIBITORS • Classified by Products • CONTINUED

Cleveland Worm & Gear Co. (502–503)
Jeffrey Manufacturing Co., The (44A–45)
Link-Belt Co. (715 to 717) Chain, Fluid, Gear, Variable Speed
Philadelphia Gear Works, Inc. (78)
Reliance Electric & Engrg. Co. (674–675)
New England Tank & Tower Co. (50)
Patterson Foundry & Machine Co., The (707–708)
Pfaudler Co., The (72–73)
Reeves Pulley Co. (34)

DRUMS, ROTARY, VACUUM

Aluminum Co. of America (70–71)
Bartlett & Snow Co., The C. O. (427–428)
Buflovak Equipment Div.—Blaw-Knox Co. (6)
Continental Can Co., Inc.—Fibre Drum Section (243–245) Fibre
Denver Equipment Co. (507)
Eimco Corp., The (604 to 606)
Goslin-Birmingham Manufacturing Co., Inc. (74)
Knapp Mills, Inc.—Andrew Knapp Construction Co., Inc. (23) Lead Lined Iron Pipe Co.
Stokes Machine Co., F. J. (80)

DRYERS, CENTRIFUGAL

American Tool & Machine Co. (412)
Baker Perkins, Inc. (62–63)
Bird Machine Co. (535–536 & 543–544)
Buflovak Equipment Div.—Blaw-Knox Co. (6)
Fletcher Works, Inc. (33)

DRYING MACHINERY AND EQUIPMENT

American Instrument Co., Inc. (385–387)
Bowen Engineering Inc. (400–400A)
Buflovak Equipment Div.—Blaw-Knox Co. (6)
Carver Inc., Fred S. (237)
Combustion Engineering—Superheater, Inc.—(67) Raymond Pulverizer Div. Flash Drying Systems
Denver Equipment Co. (507)
Eimco Corp., The (604 to 606)
Electric Hotpack Co., Inc., The (655–656)
General American Transportation Corp. (285–287)
Hardinge Company Incorporated (60)
Jeffrey Manufacturing Co., The (44A–45)
Koven & Brother, Inc., L. O. (304–306)
Link-Belt Co. (715 to 717)
Louisville Drying Machinery Co.—Unit of General American Transportation Corp. (285–287) Indirect Direct Heat Dryers, Direct Heat Parallel Current Dryers, Drum Dryers, Rotary Steam Tube Dryers, Continuous Roller Type Dewatering Presses, Continuous Thickening Screens, Rotary Dryers
Lukenweld, Div. of Lukens Steel Co. (558 to 563) Drier Rolls, Driers, (Jacketed Steel)
Niagara Blower Co. (233-235)
Patterson Foundry & Machine Co., The (707–708) Pebble, Ball, Tube, Rod
Patterson-Kelley Co., Inc. (274 to 276)
Pfaudler Co., The (72–73)
Procter & Schwartz, Inc. (15)
Rockwell Co., W. S. (447)
Rosevear Co., M. B. (602)
Selas Corp. of America (533–534) Dehydrators
Blaw-Knox Co. (13–14)
Stokes Machine Co., F. J. (80)
Bartlett & Snow Co., The C. O. (427–428)
Plate Coil Div. Kold-Hold Mfg. Co. (726)

DUST AND FUME COLLECTING SYSTEMS

Aluminum Co. of America (70–71)
American Air Filter Co., Inc. (460–461)
American Hard Rubber Co. (303–305) Rubber Lined
American Wheelbrator & Equipment Corp. (481 to 484)
Bartlett & Snow Co., The C. O. (427–428)
Blaw-Know Co. (13–14)
Day Co., The (450)
Dracco Corp. (709–710)
Falstrom Co. (510–511)
Hardinge Company Incorporated (60) Dust Collecting Systems
Haveg Corp. (51)
Knight, Maurice A. (53)
Pangborn Corp. (75)
Pulverizing Machinery Co. (300–302)
Schneible Co., Claude B. (421–422)
Sly Manufacturing Co., The W. W. 487–488)
Swenson Evaporator Co.—Div. of Whiting Corp. (43)

DUST AND SPRAY MASKS

Martindale Electric Co. (440)
Mine Safety Appliance Co. (376–378)
Willson Products, Inc. (419–420)

EJECTORS

Allis-Chalmers Manufacturing Co. (48–49)
Croll-Reynolds Co. (505)
Duriron Co., Inc., The (19–20)
Haveg Corp. (51)
Illinois Electric Porcelain Co. (672–673)
Ingersoll-Rand Co. (615 to 617)
Knapp Mills, Inc. — Andrews-Knapp Construction Co., Inc. (23)
Lead Lined Iron Pipe Co. (23)
National Carbon Co., Inc. (30–31)
Schutte & Koerting Co. (291)

ELECTRONIC EQUIPMENT

Allis-Chalmers Manufacturing Co. (48–49)
American Instrument Co., Inc. (385–387)
Consolidated Engineering Corp. (703–704)
Exact Weight Scale Co., The (472–473)
Falstrom Co. (510–511)
Fischer & Porter Co. (203 to 207) Remote Recorder, Controller, Totalizer
General Electric Apparatus Dept. (4)
Hart-Moisture-Meters (680)
Machlett & Son, E. (381 & A)
New York Laboratory Supply Co., Inc. (218)
Process & Instrument (518)
Radio Corp. of America—Scientific Instrument Section (627–628)
Reliance Electric & Engrg Co. (674–675)
Rodgers Co., George G. (612)
Scientific Glass Apparatus Co., Inc. (215–219)
Superior Electric Co., The (522–523)
Syntron Co. (311–313)
Titanium Alloy Manufacturing Div.—National Lead Co. (366–368)
Welch Manufacturing Co., W. M. (405–406)

ELEVATORS

Allis-Chalmers Manufacturing Co. (48–49)
Barrett-Cravens Co. (239–241)
Day Co., The (450) Bucket
Denver Equipment Co. (507)
Great Western Manufacturing Co. (372–374)
Gump Co., B. F. (362–364)
Bartlett & Snow Co., The C. O. (427–428)
Jeffrey Manufacturing Co., The (44A–45)
Link-Belt Co. (715–717) & Conveyors
National Engineering Co. (554–555)
Sprout, Waldron & Co., Inc. (550–553)

EMULSIFIERS

Alrose Chemical Co. (489)
Atlas Powder Co. (46–47)
Carbide & Carbon Chemicals Corp. (17–18 & 92)
Chemicolloid Laboratories, Inc. (257)
Denver Equipment Co. (507)
Emery Industries, Inc. (283)
Eppenbach, Inc. (278)
Hercules Powder Co. (7W)
Manton Gaulin Manufacturing Co., Inc. (476)
Metal Glass Products Co., Inc., (425–426)
Oronite Chemical Co. (705)
Patterson Foundry & Machine Co., The (707–708)
Pfaudler Co., The (72–73)
Premier Hill Corp. (312–314)
Rietz Manufacturing Co. (648)
Victor Chemical Works (729–734)
Tri-Home Corp. (626)

EMULSIONS

American Polymer Corp. (35–36)
American Resinous Chemicals Corp. (35–36)
Hercules Powder Co. (7W)

ENAMELED APPARATUS

Glascote Products, Inc. (657–658) Tanks & Reactors
Pfaudler Co., The (72–73)

ENAMELS

American Resinous Chemicals Corp. (35–36)
Atlas Powder Co. (46–47)
Titanium Alloy Manufacturing Div.—National Lead Co. (366–368)
U. S. Stoneware Co., The (89–91)

ENGINEERS

Artisan Metal Products, Inc.—Henry E. Jacoby (540–542)
Bowser, Inc. (461A)
Bowen Engineering, Inc. (400–400A)
Day Co., The (450) Dust Control
Falstrom Co. (510–511)
Grinnell Co., Inc. (251)
Koch Engineering Co., Inc. (479–480)
Merco Centrifugal Co. (448) Separational
National Engineering Co. (554–555)
Niagara Filter Corp. (417–418) Filtration
%Proportioneers, Inc.% (477-478) Proportioning
Richardson Scale Co. (659–660)
Rosevear Co., M. B. (602)
Schutte & Koerting Co. (291)
Selas Corp. of America (533–534) Gas
Sharples Corp. (58–59) Process
Snell Inc., Foster D. (37)
Union Iron Works (431)
Blaw-Knox Co. (13–14)
Stokes Machine Co., F. J. (80)

EVAPORATORS

Ace Glass, Incorporated (383)
Aluminum Co. of America (70-71
American Hard Rubber Co. (303–305) Rubber Linings for
Artisan Metal Products, Inc.—Henry E. Jacoby (540–542)
Bowen Engineering, Inc. (400–400A)
Buflovak Equipment Div.—Blaw-Knox Co. (6)

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DAVISON SILICOFLUORIDES simplify ACID POLYMERIZATION

Lower Curing Temperature
Speed Curing Cycle
Give More Uniform Results

Used as weak acid curing catalysts, Davison Silicofluorides provide greater control over the curing process of urea-aldehyde, phenol-formaldehyde and other synthetic resin plastics.

Since the free-flowing crystals of Davison Silicofluorides are inactive until in solution with water, it is practical to combine them with dry resins in advance of processing.

Davison Silicofluorides will not harm cellulosic materials or reduce tensile strength of the finished product. Davison Silicofluorides save time in the curing cycle . . . save fuel by permitting lower temperature curing . . . give more uniform processing.

Data sheets on all Davison Silicofluorides are available—please mention your proposed application when writing . . .

TYPICAL PRODUCTS MANUFACTURED with the aid of DAVISON SILICOFLUORIDES

Laundry Sours • Plastics • Aluminum • Felt • Leather • Electroplated Products • Lead • Beverages • Plywood • Adhesives • Concrete • Asphalt Compounds • Glass • Enamel • Textiles • Rubber

THE DAVISON CHEMICAL CORPORATION
Progress through Chemistry
BALTIMORE-3, MD.

PRIMARY PRODUCERS OF SILICOFLUORIDES

ALSO PRODUCERS OF: SILICA GEL, CATALYSTS, CASTING COMPOUNDS, ALUM, INORGANIC ACIDS, FERTILIZER MATERIALS, ASPHALT COMPOUNDS

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Conkey Filter Unit—General American Transportation Corp. (285–287) Integral (self Supporting) Long Tube Vertical Evaporators, Long Tube Film Type Vertical Evaporators, Vertical Tube Forced Circulation Evaporators, Submerged Tube Forced Circulation Evaporators, Horizontal Submerged Tube Forced Circulation Evaporators, Flat Plate Heating Surface Evaporators
Fansteel Metallurgical Corp. (282) (284)
General American Transportation Corp. (285–287)
Glascote Products, Inc. (657–658)
Goslin-Birmingham Manufacturing Co., Inc. (74)
Greiner Co., The Emil (226–228) Laboratory, Flash
Haveg Corp. (51)
Knapp Mills, Inc. Andrews-Knapp Construction Co., Inc. (23) Lead Lined Iron Pipe Co.
Koven & Brother, Inc., L. O. (304–306)
National Lead Co. (247)
Patterson Foundry & Machine Co., The (707–708)
Patterson-Kelley Co., Inc. (274–276)
Plaudler Co., The (72–73)
Schutte & Koerting Co. (291)
Swenson Evaporator Co.—Div. of Whiting Corp. (43)
Union Iron Works (431)
Stokes Machine Co., F. J. (80)
Plateeoil Div. Kold-Hold Mfg. Co. (726)

EXHAUSTERS

Day Co., The (450) Industrial
Duriron Co., Inc., The (19–20)
General Ceramics & Steatite Corp. (2)
Great Western Manufacturing Co. 372–374)
Haveg Corp. (51)
Ingersoll-Rand Co. (615–617)
Kewanee Manufacturing Co. (308–310)
Mine Safety Appliance Co. (376–378)
Panghorn Corp. (75)
Schutte & Koerting Co. (291)

EXPLOSIVES

Atlas Powder Co. (46–47)
Hercules Powder Co. (7W)

EXTRACTION PLANTS

Allis-Chalmers Manufacturing Co. (48–49)
Artisan Metal Products, Inc.—Henry E. Jacoby (540–542)
Buflovak Equipment Div.—Blaw-Knox Co. (6)
General Ceramics & Steatite Corp. (2)
Patterson Foundry & Machine Co., The (707–708)
York Co., Inc., Otto H. (380) Liquid-Liquid
Blaw-Knox Co. (13–14)
Bartlett & Snow Co., The C. O. (427–428)

EXTRACTORS

Aluminum Co. of America (70–71)
American Tool & Machine Co. (412)
Artisan Metal Products, Inc.—Henry E. Jacoby (540–542)
Bird Machine Co. (535–536 & 543–544)
Fletcher Works, Inc. (33)
Koch Engineering Co., Inc. (479–480)
Koven & Brother, Inc., L. O. (304–306)
Patterson Foundry & Machine Co., The (707–708)
Pfaudler Co., The (72–73)
Scientific Glass Apparatus Co., Inc. (215–219)
Tolhurst Centrifugals Div.—American Machine & Metals, Inc. (68–69)
Welding Engineers, Inc. (407–408)
Will Corp. (225–227)
York Co., Inc., Otto H. (380) Solvent, Mist Extractors

FEEDERS

Bartlett & Snow Co., The C. O. (427–428)
Builders-Providence, Inc. (493–495)
Denver Equipment Co. (507)
Eimco Corp., The (604–606)
Fuller Co. (315–317)
Gump Co., B. F. (352–364)
Hardinge Company Incorporated (60)
Jeffrey Manufacturing Co., The (44A–45)
Lapp Insulator Co., Inc. (441–442)
Link-Belt Co. (716–717)
Niagara Filter Corp. (417–418) Filter Aid
Omega Machine Co. (493–495)
Patterson Foundry & Machine Co., The (707–708)
Permutit Co., The (403–404)
%Proportioneers, Inc.% (477–478) Chemical
Richardson Scale Co. (659–660)
Rietz Manufacturing Co. (648)
Roy Co., Milton (432–433) Liquid
Syntron Co. (311–313)
Wallace & Tiernan Co., Inc. (519–521)

FILLERS (KIND)

Dicalite Div.—Great Lakes Carbon Corp. (86) Mineral Fillers for use in following — Products — Asphalt (Coatings & Mastics) Paint (Flatting Agents), Polishes & Cleansers, Plastics & Rubber
Horix Manufacturing Co. (413–414) for Liquids
Johns-Manville (95–94) Mineral
Perl-Oussani Machine Manufacturing Co. (644–645) Liquid Cream
Pfaudler Co., The (72–73)

FILLING MACHINES

Allis-Chalmers Manufacturing Co. (48–49)
Colton Co., Artuhr (719)
Ertel Engineering Corp. (508–509)
Exact Weight Scale Co., The (472–473)
Glengarry Processes, Inc. (564)
Gump Co., B. F. (362–364)
Horix Manufacturing Co. (413–414)
Kiefer Machine Co., The Karl (24)
Lasko Co., Inc., The (461B) Tablet
Lapp Insulator Co., Inc. (441–442)
M R M Co., Inc. (638) Liquid
Perl-Oussani Machine Manufacturing Co. (644–645) Bottle & Can Filling, Ampoule Filling, Tube Filling & Closing
Pfaudler Co., The (72–73)
Pneumatic Scale Corp., Ltd. (22)
Popper & Klein, Inc. (209–211 & 370)
%Proportioneers, Inc.% (477–478) Small Quantity
Richardson Scale Co. (659–660)
Rodgers Co., George G. (612)
St. Regis Sales Corp. (530–532)
Bowser, Inc. (461A)
Chase Equipment Co. (547)

FILM

General Aniline & Film Corp. (619–620)

FILTER AIDS

Dicalite Div.—Great Lakes Carbon Corp. (86)
Ertel Engineering Corp. (508–509)
Hercules Filter Corp. (443–445)
Johns-Manville (93–94)
Machlett & Son, E. (381 & A)
Will Corp. (225–227)
Republic Seitz Filter Corp. (557)

FILTER CLOTH

Alsop Engineering Co. (293)
Filtration Engineers Incorporated (8)
Hercules Filter Corp. (443–445)
Jacoby-Tarbox Corp.—Henry E. Jacoby (540–542)
Machlett & Son, E. (381 & A)
Niagara Filter Corp. (417–418)
Shriver & Co., Ins., T. (12)
Sparkler Manufacturing Co. (516–517)
Tyler Co., The W. S. (88)
Republic Seitz Filter Corp. (557)

FILTER CLOTH (METALLIC)

Hercules Filter Corp. (443–445)
Machlett & Son, E. (381 & A)
Micro Metallic Corp. (671)
Newark Wire Cloth Co. (83–84)
Niagara Filter Corp. (417–418)
Oliver United Filters, Int. (66)
Rockwell Co., W. S. (447)
Roebling's Sons Co., John A. 358–360)
Shriver & Co., Inc., T. (12)
Sparkler Manufacturing Co. (516–517)
Republic Seit Filter Corp. (557)

FILTER PAPER

Alsop Engineering Corp. (293)
Angel & Co., Inc., H. Reeve (214)
Artel Engineering Corp. (508–509)
General Laboratory Supply Co. (711)
Hercules Filter Corp. (443–445)
Jacoby-Tarbox Corp., Henry E. Jacoby (540–542)
Machlett & Son, E. (381A)
New York Laboratory Supply Co., Inc. (218)
Palo-Myers, Inc. (642)
Shriver & Co., Inc. T. (12)
Sparkler Manufacturing Co. (516–517)
Welch Manufacturing Co., W. M. (405–406)
Will Corp. (225–227)
Republic Seitz Filter Corp. (557)

FILTERS (KIND)

Alsop Engineering Corp. (293) Sheet Type for all Liquids
American Air Filter Co., Inc. (460–461) Air
Belco Industrial Equipment Div., Inc. (574) Water
Bird Machine Co. (535–536 & 543–544) Centrifugal & Vacuum
Carver Inc., Fred S. (237) Hydraulic Filter Presses
Conkey Filter Unit-General American Transportation Corp. (285–287) Rotary Disc Vacuum Filters, Rotary Drum Vacuum Filters, Leaf Pressure Filters, Vacuum Drum Filters, Rotary Hopper Vacuum Dewaterers
Day Co., The (450) Dust
Denver Equipment Co. (507) Vacuum & Pressure
Eimco Corp., The (604–606) Continuous Vacuum
Eriez Manufacturing Co. (631–632) Magnetic
Etel Engineering Corp. (508–509)
Filteration Engineers Incorporated (8) Rotary Vacuum
Fletcher Works, Inc. (33) Centrifugal
General American Transportation Corp. (285–287)
General Ceramics & Steatite Corp. (2) Vacuum Pressure Stoneware
Goslin-Birmingham Manufacturing Co., Inc. (74)
Bowser, Inc. (461A)
Enzinger Union (713–714)

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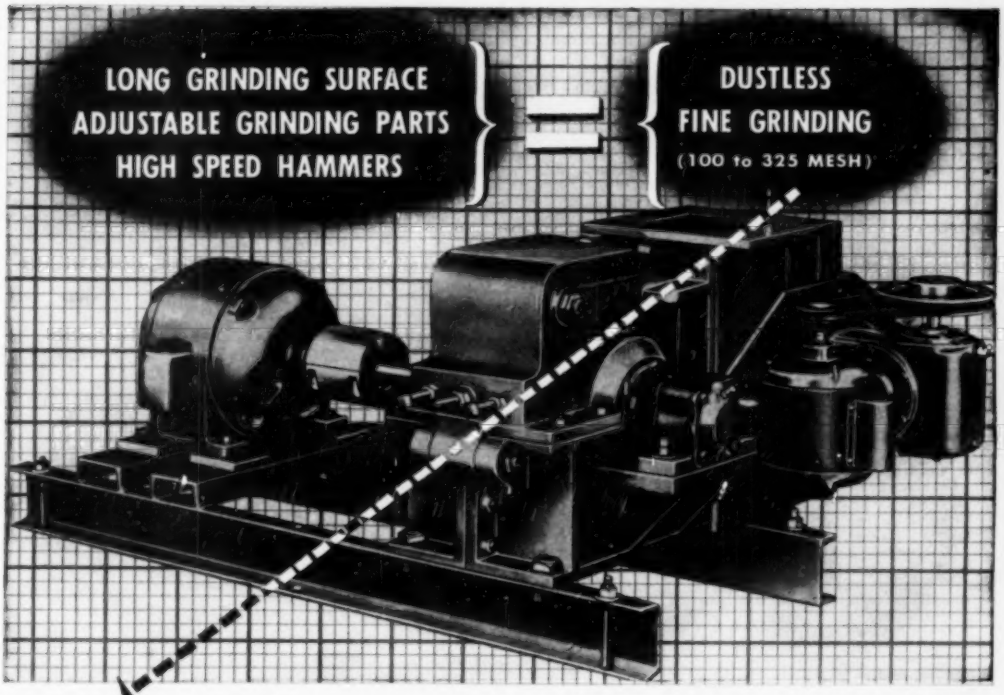
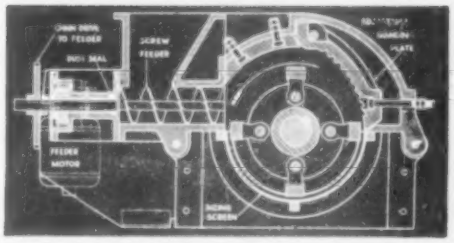


WILLIAMS
HELIX-SEAL HAMMERMILL

NO FANS, CYCLONES OR SEPARATORS. Material fed into screw feeder is discharged at bottom of mill completely pulverized . . . with no oversizes or tailings to be separated. Screw feeder also acts as a seal against inrush of air. No dust! Williams' Helix Mill grinds many materials to 325 mesh. 100 to 200 mesh products are common on more difficult materials. Yes! It'll grind wet and sticky materials, too! Variable speed control permits grinding of different kinds of materials. **EASY, INEXPENSIVE TO INSTALL AND OPERATE!** Small floor space and lack of vibration calls for simplest of installation. Only requirement is a tight bin below mill with some sort of outlet. All parts are easily cleaned . . . on most materials simply by brushing. Feeder drive consists of roller chain drive from fractional horsepower gear head motor to feeder screws.

WILLIAMS PATENT CRUSHER & PULVERIZER CO.
2706 N. NINTH STREET ST. LOUIS 6, MO.



Sectional view of Helix-Seal Mill. Note long grinding plate against which the material is ground before it reaches the sizing screen. This plate is adjustable to compensate for wear.

WILLIAMS ALSO MAKES . . .

Heavy-duty hammermills; impact and roller mills for 200 to 325 mesh grinding; drier mills; air separators; vibrating screens; steel bins; complete "packaged" crushing and grinding plants.

WC48-7

WILLIAMS

CRUSHERS GRINDERS SHREDDERS

VISIT OUR EXHIBIT AT THE 22nd EXPOSITION OF CHEMICAL INDUSTRIES - BOOTH NO. 295

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EXHIBITORS • Classified by Products • CONTINUED

Hardinge Company Incorporated (60) Automatic Backwash Sand Filters
Haveg Corp. (51)
Hercules Filter Corp. (443–445)
Illinois Water Treatment Co. (611) Water
Kiefer Machine Co., The Karl (24)
Knight, Maurice A. (53)
Machlett & Son, E. (381 & A)
Micro Metallic Corp. (671) Porous Stainless Steel
National Carbon Co., Inc. (30–31) Carbon
Niagara Filter Corp. (417–418) Pressure
Norton Co. (415–416) Porous Plates—Tubes
Oliver United Filters, Inc. (66) Continuous Vacuum Filters—Precoat Filters, Panel Filters, Horizontal Rotary Filter, Pulp Filter, Ring Valve Filters, Top Feed Filters, Hopper Dewaterers; Continuous Pressure Filters—Precoat Filters, Batch Pressure Filters—Pressure Filter
Patterson Foundry & Machine Co., The (707–708) Filter Presses
Permutit Co., The (403–404) Water, Gravity, Pressure, Neutralite, Manganese
Popper & Klein, Inc. (209–211 & 370)
%Proportioneers, Inc.% (477–478) Diatomaceous Earth
Selas Corp. of America (533–534) Pharmaceutical, Bacteriological, Chemical
Shriver & Co., Inc., T. (12) Presses
Sparkler Manufacturing Co. (516–517) Horizontal Plate
Sperry & Co., D. R. (540–542)—Henry E. Jacoby Pressure
Swenson Evaporator Co. (43) Div. of Whiting Corp.
U. S. Stoneware Co., The (89–91) Stoneware & Porcelain Suction
York Co., Inc., Otto H. (380) Wire Mesh
Republic Seitz Filter Corp. (557)
Pulverizing Machinery Co. (300–302) Dust

FIRE DETECTION

Penwal Incorporated (603)
Kidde & Co., Inc., Walter (423)
Rosevear Co., M. B. (602)

FIRE EXTINGUISHERS

Grinnell Co., Inc. (251)
Kidde & Co., Inc., Walter (423)
Machlett & Son., E. (381 & A)
Welch Manufacturing Co., W. M. (405–406)

FIRE PROOFING COMPOUNDS

General Aniline & Film Corp. (619–620)
Hercules Powder Co. (7W)
Machlett & Son., E. (381 & A)
Victor Chemical Works (729–734)

FITTINGS

Aluminum Co. of America (70–71)
American Hard Rubber Co. (303–305) Corrosion Resisting Hard Rubber, Rubber Lined & Plastics
Cooper Alloy Foundry Co., The (565–566) Stainless Steel, Nickel, Monel
Crane Co. (297)
Duriron Co., Inc., The (19–20)
General Alloys Co. (299) High Temperature
General Ceramics & Steatite Corp. (2)
Glascote Products, Inc. (657–658)
Grinnell Co., Inc. (251)
Haveg Corp. (51)
International Nickel Co., Inc., The (9–10) Cast
Ladish Co. (613–614)
Lead Lined Iron Pipe Co. (23)
Luzerne Rubber Co., The (528–529) Hard Rubber
Moore Co., J. Arthur (512–513) Orifice
National Lead Co. (247)
Parker Appliance Co., The (21) Tube
Pfaudler Co., The (72–73)
Taylor Forge & Pipe Works (727–728)
Tri-Clover Machine Co. (498)
Tube Turns, Inc. (636–637) Welding
Walworth Co. (316–318) Pipe

FLOORING

Aluminum Co. of America (70–71)
Haveg Corp. (51)
Johns-Manville (93–94)
Norton Co. (415–416) Non-Slip
U. S. Stoneware Co., The (89–91)
U. S. Steel Corp. (76–77)

FLOTATION MACHINERY

Denver Equipment Co. (507)

FOOD INDUSTRIES EQUIPMENT

Aluminum Co. of America (70–71)
American Hard Rubber Co. (303–305) Hard Rubber, Rubber Lined & Plastics
Ampco Metal, Inc. (268)
Artisan Metal Products, Inc. Henry E. Jacoby (540–542)
Baker Perkins, Inc. (62–63)
Blickman Inc., S. (474–475)
Buflovak Equipment Div.—Blaw-Knox Co. (6)
Carver Inc., Fred S. (237)
Chemicolloid Laboratories, Inc., (257)
Colton Co., Arthur (719)
Combustion Engineering—Superheater Inc. (67) Raymond Pulverizer Division
Day Co., The (450) Stainless Steel
Day Co., The J. H. (718)
Dorr Co., Inc., The (64)
Eppenbach, Inc. (278)
Falstrom Co. (510–511)
Fischer & Porter Co. (203–207) Flow . Meters
Fitzpatrick Co., The W. J. (401–402)
Glascote Products, Inc. (657–658)
Glengarry Processes, Inc. (564)
Great Western Manufacturing Co. (372–374)
Gump Co., B. F. (362–364)
Hart-Moisture-Meters (680)
Hercules Filter Corp. (443–445)
Jeffrey Manufacturing Co., The (44A–45)
Koch Engineering Co., Inc. (479–480)
Koven & Brother, Inc., L. O. (304–306)
Lawrence Machine & Pump Corp. (663)
Luzerne Rubber Co., The (528–529) Hard Rubber

FOOD INDUSTRIES EQUIPMENT

M R M Co., Inc. (638)
Magnetrol, Inc. (724)
Metal Glass Products Co., Inc. (425–426)
Minneapolis-Honeywell Regulator Co. —Brown Instruments Div. (40–41) Industrial Instruments of Non-Indicating, Indicating, Recording & Controlling Types for Temperature, Pressure, Humidity, Flow, Liquid Level, & pH.
Niagara Blower Co. (233–235)
Niagara Filter Corp. (417–418)
Omega Machine Co. (493–495)
Perl-Oussani Machine Manufacturing Co. (644–645)
Pfaudler Co., The (72–73)
Platecoil Division—Kold-Hold Manufacturing Co. (726)
Premier Mill Corp. (312–314)
Pressed Steel Tank Co. (348–352)
Productive Equipment Corp. (549)
Richardson Scale Co. (659–660)
Richmond Manufacturing Co. (519)
Rietz Manufacturing Co. (648)
Rodgers Co., George G. (612)
Rosevear Co., M. B. (602)
Roy Co., Milton (432–433)
Seederer-Kohlbusch, Inc. (389)
Separations Engineering Corp. (52)
Sprout, Waldron & Co., Inc. (550–553)
Sturtevant Mill Co. (3)
Syntron Co. (311–313)
Tri-Clover Machine Co. (498)
Tyler Co., The W. S. (88)
Wallace & Tiernan Co., Inc. (519–521)
Republic Seitz Filter Corp. (557)
Stokes Machine Co., F. J. (80)

FURNACES AND ACCESSORIES

American Instrument Co., Inc. (385–387)
Electric Hotpack Co., Inc., The (655–656) Electric Laboratory — Heat Treating
Fischer & Porter Co. (203–207) Flow Rate Meters
Fisher Scientific Co.—Eimer & Amend (57)
Gamma Scientific Co. (497)
General Alloys Co. (299) Furnace Parts
Machlett & Son, E. (381 & A)
Rockwell Co., W. S. (447) Gas, Oil, Electric
Rosevear Co., M. B. (602) Electric
Scientific Glass Apparatus Co., Inc. (215–219) Laboratory
Selas Corp. of America (533–534) Gas
Thomas Co., Arthur H. (665–666) Laboratory
Trent Incorporated (526–527) Electric, Laboratory, Industrial
Union Iron Works (431) Process Furnaces
Will Corp. (225–227) Laboratory Muffle

GAGES (KIND)

Bailey Meter Co. (56) Draft
Builders-Providence, Inc. (493–495)
Energy Control Co., Inc. (722) Pressure
Fischer & Porter Co. (203–207) Sight, Liquid Level, Flow, Differential
General Electric Apparatus Dept. (4) Electrical
Greiner Co., The Emil (226–228) Manometer
Hart-Moisture-Meters (680) Moisture
Hoke Incorporated (213) Pressure
Jerguson Gage & Valve Co. (514) Liquid Level
Machlett & Son, E. (381 & A)
Minneapolis-Honeywell Regulator Co. —Brown Instruments Div. (40–41) Indicating, Recording & Controlling for Temperature, Pressure, Humidity, Flow, Liquid Level, ph.
Powell Co., The Wm (54) Liquid Level
Process & Instrument (518) Hi-Vacuum
Uehling Instrument Co. (356) Liquid Level, Vacuum, Pressure, Draft, U-Tubes, Barometer, Absolute Pressure, Combined Pressure & Vacuum, Manometers
Welch Manufacturing Co., W. H. (405–406) Vacuum
Weston Electrical Instrument Corp. (263) Recording Pressure

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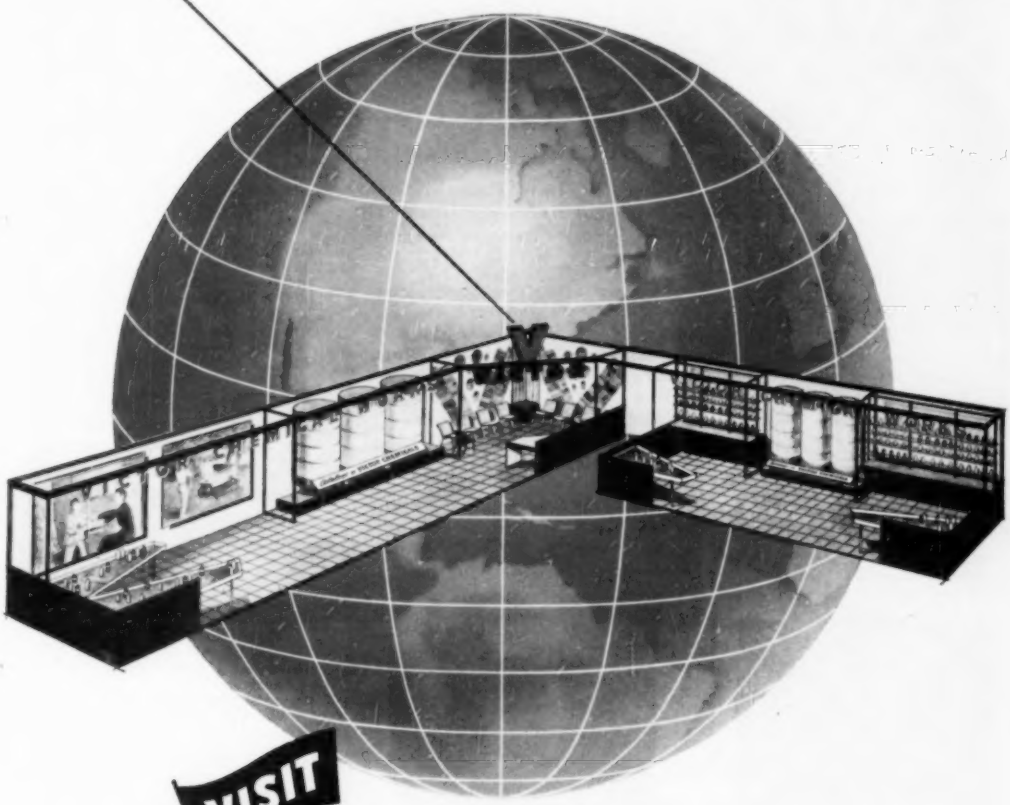
...for a world of information on phosphates, phosphorus compounds, formates and oxalates



VISIT

VICTOR CHEMICAL WORKS

Booths 729—734 . . . 4th Floor

Exposition of Chemical Industries . . . Grand Central Palace, New York City, November 28 through December 3, 1949.

VICTOR CHEMICAL WORKS

VICTOR CHEMICAL WORKS

141 West Jackson Boulevard, Chicago 4, Illinois

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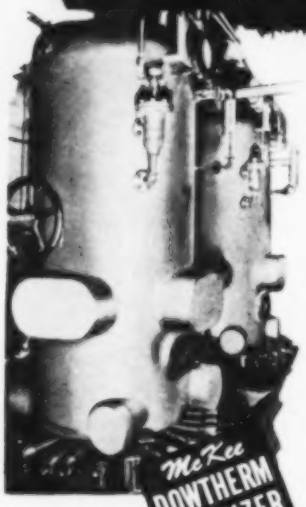
Industrial Process Greatly Improved
and FUEL COSTS
CUT IN HALF!

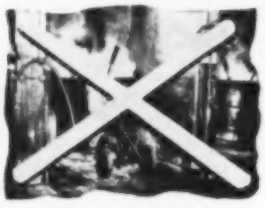


1,200,000 BTU Gas-Fired Dowtherm Vaporizer in varnish plant.

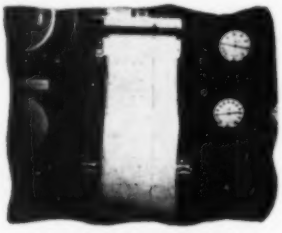
Varnish-Making Problems Vanish!

If you have an industrial process in which the heat transfer or other steps present difficulties, investigate the use of Dowtherm Vaporizers.

For instance in the varnish plant installation shown above, Dowtherm did away with many difficulties encountered in their previous process. Replacing the costly, manually handled, unscientific, old equipment, the Dowtherm Kettle and Vaporizer provide automatic operation; scientifically correct, uniform heat control and freedom from "burning" and "boiling-over" hazards. There is more effective cooling, easier cleaning, and longer kettle life. In addition, the operators say fuel costs are cut at least IN HALF compared with direct-firing.

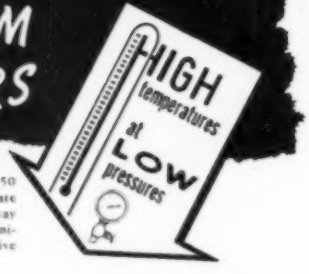


Old type manually operated kettle on wheels.



Automatic controls used with Dowtherm-jacketed kettle, and Vaporizer.

with DOWTHERM VAPORIZERS



Get high temperature vapor-phase heat (up to 650 deg. F.) with as low as 35 lbs. pressure; eliminate high pressure system expense and hazards; do away with overheating and scorching; get faster, more uniform heating at lower cost. Write for descriptive bulletin and Dowtherm case histories. Representatives in principal cities.

Eclipse Fuel Engineering Company
ROCKFORD ILLINOIS
McKee Eclipse

EXHIBITORS Classified by Products

GAS BOOSTERS
Ingersoll-Rand Co. (615–617)
Schutte & Koerting Co. (291) Jet
Selas Corp. of America (533–534)

GAS PRODUCTS
Eclipse Fuel Engineering Co. (504) Gas Fired Heat Treating
Hardinge Company Incorporated (60)
Schutte & Koerting Co. (291) Jet

GAS PURIFIERS
Knight, Maurice A. (53)
Koch Engineering Co., Inc. (479–480)
Machlett & Son, E. (381 & A)
York Co., Inc., Otto H. (380)

GASES
Matheson Co., The (271)
Ohio Chemical & Manufacturing Co., The (216)

GEARS
Ampco Metal, Inc. (268)
Cleveland Worm & Gear Co. (502–503)
Jeffrey Manufacturing Co., The (44A–45)
Link-Belt Co. (715–717) Gearmotors
St. Regis Sales Corp. (530–532)
Bartlett & Snow Co., The C. O. (427–428)
Philadelphia Gear Works (78)

GLASS OPTICAL
Machlett & Son, E. (381–A)
Scientific Glass Apparatus Co., Inc. (215–219)
Willson Products, Inc. (419–420)

GLASSWARE
Ace Glass Incorporated (383)
Aloe Company, A. S. (720)
Corning Glass Works (391–395) Chemical
Fischer & Porter Co. (203–207)
Fisher Scientific Co.—Eimer & Amend (57) Laboratory
General Laboratory Supply Co. (711)
Greiner Co., The Emil (226–228) Laboratory
Hanovia Chemical Manufacturing Co. (458–459) Quartz
Kimble Glass, Div. of Owens-Illinois Glass Co. (342–344) Laboratory
Machlett & Son, E. (381–A)
New York Laboratory Supply Co., Inc. (218)
Palo-Myers, Inc. (642)
Scientific Glass Apparatus Co., Inc. (215–219)
Standard Scientific Supply Co. (618)
Thomas Co., Arthur H. (665–666)
Welch Manufacturing Co., W. M. (405–406)
Will Corp. (225–227) Laboratory

GRATING
Koven & Brother, Inc., L. O. (304–306)
Machlett & Son, E. (381–A)

GRINDERS
Bramley Machinery Corp. (524–525)
Eppenbach, Inc. (278)
Jeffrey Manufacturing Co., The (44A–45)
Machlett & Son, E. (381–A)
Patterson Foundry & Machine Co., The (707–708)
Premier Mill Co. (312–314)
Pulverizing Machinery Co. (300–302)
Rietz Manufacturing Co. (648)
Sprout, Waldron & Co., Inc. (550–553)
Sturtevant Mill Co. (3)
Will Corp. (225–227) Laboratory
Union Process Co. (470)

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Easy, Safe and Positive-

LIMITORQUE

..by REMOTE CONTROL

LIMITORQUE operates by the "push of a button"

...one man can operate any number of Valves, at any distance, from a panel board..

LIMITORQUE VALVE CONTROLS

Think of the savings effected in time and money by eliminating men going from one valve to another (many of which are at distant locations),—not to mention the time required to shut or open each valve. LimiTorque Remote Control not only prevents this waste, but enables one man to merely "push buttons" and actually see on a panelboard whether the valves are open or closed. Then too, there is the important safety factor afforded by LimiTorque Remote Control, because men do not have to go to high, low, dangerous or inaccessible locations to open and close valves. Still further, LimiTorque prevents damage to seats, discs, stems, etc., because it "automatically" shuts-off the power, should an obstruction in closing occur.

Various LimiTorques are available for different requirements on all types of valves (globe, gate, butterfly, plug, etc.)—and too, LimiTorques may be supplied for actuation by any power source, such as electricity, steam, water, gas, oil or air.

Thousands of LimiTorques are in use throughout the world, on land and sea. Be convinced; send for our 96-page catalog, L-48, and please use your Business Letterhead when requesting same.

See us at Booth 78—Chemical Show—Nov. 28-Dec. 3—New York City

Philadelphia Gear Works, INC.

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.

NEW YORK • PITTSBURGH • CHICAGO • HOUSTON

IN CANADA: WILLIAM AND J. G. GREEY LIMITED, TORONTO

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

Guide & Directory Page 33

NOW - Nylon Eyecups

for Safety Goggles

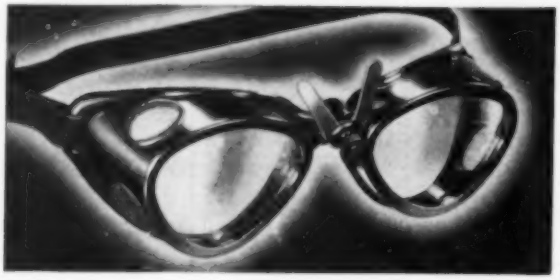
Greater Comfort
Greater Vision
Greater Strength

Style L1

Nylon cups fitted with WILLSON-WELD* lenses for gas welding. Indirect ventilation reduces flash and glare hazard.

Style L2

Nylon cups fitted with WILLSON Super-Tough* lenses for chipping, snagging and other heavy duty operations. Cups are well ventilated to reduce fogging.



For the protection of your workers' eyes—and *your* profits, WILLSON offers this new development in safety goggles. Eyecups of NYLON combine unusual strength with exceptionally wide vision. Yet they are lighter than other heavy duty goggles, contributing to comfort which is a must in getting safety equipment worn.

Extra wide vision is provided by the triangular lens shape, an exclusive WILLSON feature. The adjustable nose bridge and rolled edges of the eyecups assure good fit around the eyes while the adjustable elastic headband is adaptable to all head sizes.

*® WILLSON Established 1870

NEW CATALOG *In addition to product information, it contains information on safety glass, filter glass, respiratory hazards, etc., which will help you select proper safety equipment to meet specific hazards. Send for it!*

WILLSON PRODUCTS, INC., 223 WASHINGTON STREET, READING, PENNA.

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EXHIBITORS Classified by Products

Tri-Homo Corp. (626)
Williams Patent Crusher & Pulverizer Co. (295)

HEAT EXCHANGERS

Aluminum Co. of America (70–71)
American Instrument Co., Inc. (385–387)
Amersil Co., Inc. (454–455)
Artisan Metal Products, Inc.—Henry E. Jacoby (540–542)
Blaw-Knox Co. (13–14)
Blickman Inc., S. (474–475)
Corning Glass Works (391–395) Glass
Croll-Reynolds Co. (505)
Duriron Co., Inc., The (19–20)
Eastern Industries, Inc. (220–222–224)
Eclipse Fuel Engineering Co. (504)
Fansteel Metallurgical Corp. (282–284)
General Ceramics & Steatite Corp. (2)
Goslin-Birmingham Manufacturing Co., Inc. (74)
Haveg Corp. (51)
Heil Process Equipment Corp. (539) Impervious Graphite, Immersion, Shell & Tube Types
Ingersoll-Rand Co. (615–617)
Knapp Mills, Inc.—Andrews-Knapp Construction Co., Inc. (23) Lead Lined Iron Pipe Co.
Knight, Maurice A. (53)
Koven & Brother, Inc., L. O. (304–306)
National Carbon Co., Inc. (30–31)
Niagara Blower Co. (233–235)
Patterson Foundry & Machine Co., The (707–708)
Patterson-Kelley Co., Inc. (274–276)
Pfaudler Co., The (72–73)
Plate Coil Div. Kold-Hold Mfg. Co. (426)
Pressed Steel Tank Co. (348–352)
Rietz Manufacturing Co. (648)
Rosevear Co., M. B. (602) Electric
Schutte & Koerting Co. (291)
Stokes Machine Co., F. J. (80)
Swenson Evaporator Co.—Div. of Whiting Corp. (43)
Union Iron Works (431)
Wiegand Co., Edwin L. (601)

HEATERS AND HEATING EQUIPT.

Aluminum Co. of America (70–71)
American Instrument Co., Inc. (385–387)
Amersil Co., Inc. (454–455)
Eclipse Fuel Engineering Co. (504)
Fansteel Metallurgical Corp. (282–284)
General Ceramics & Steatite Corp. (2)
Grinnell Co., Inc. (251)
Machlett & Son, E. (381 & A)
Niagara Blower Co. (233–235)
Plate Coil Div. Kold-Hold Mfg. Co. (426)
Rosevear Co., M. B. (602)
Rosevear Co., M. B. (602) Infra Red, Radiant Electric
Schutte & Koerting Co. (291)
Trent, Incorporated (526–527)
Wiegand Co., Edwin L. (601)

HEATING SYSTEMS AND ACCESSORIES

American Instrument Co., Inc. (385–387)
Blaw-Knox Co. (13–14)
Magnetrol, Inc. (724) Accessories
Rosevear Co., M. B. (602) Heat Electric
Sarco Co., Inc. (11) Incl. Traps—Steam
Selas Corp. of America (533–534)
Wiegand Co., Edwin, L. (601)

HOISTS

Barrett-Cravens Co. (239–241)
Denver Equipment Co (507)

Controlled Quality

gives you steel heat code protection

ON EVERY FITTING AND FLANGE IN THE COMPLETE LADISH LINE

Pioneered by Ladish . . . and long recognized as its symbol of Controlled Quality . . . the Ladish steel heat code is visible evidence of added reliability resulting from metallurgical integrity. It protects you with certified laboratory reports always available giving specific test data as proof that all requirements of standard or special specifications are met or exceeded.

L

TO MARK PROGRESS

A COMPLETE LINE PRODUCED UNDER ONE ROOF
. . . ONE RESPONSIBILITY

LADISH CO.

CUDAHY, WISCONSIN
MILWAUKEE SUBURB

DISTRICT OFFICES: New York • Buffalo • Pittsburgh • Philadelphia • Cleveland
Chicago • St. Paul • St. Louis • Atlanta • Houston • Los Angeles

THE FITTINGS LINE INCLUDING CARBON, ALLOY AND STAINLESS STEELS, ALUMINUM, BRASS AND COPPER

THAT IS COMPLETE IN TYPES, SIZE RANGES AND MATERIALS

How much do shutdowns for repairs COST?

NOTE: Fansteel invites you to investigate the possibilities of important savings in your own plant—to see why CONTINUOUS OPERATION results from the use of . . .

ACID-PROOF TANTALUM
Chemical Processing Equipment

•

Faithfully recorded history tells the story. In hundreds of installations Tantalum heat exchangers, condensers, Fansteel-built HCl Absorption Plants and other units are giving perfect performance long after the equipment has paid for itself.

TANTALUM is the only known material that combines these characteristics to the greatest degree in a single element:

ACID-PROOF: Not merely "resistant," but immune to corrosion.

High strength—no damage from thermal shock.

Unrestricted heat flow. No blocking of heat by partly corroded surfaces. High thermal efficiency.

Fansteel engineers are at your service for recommendations and designs. An informative booklet "The Metal Tantalum" is available on request. Fansteel Metallurgical Corporation, North Chicago, Illinois.

USE TANTALUM WITH ECONOMY for most acid solutions and corrosive gases or vapors except HF, alkalis or substances containing free SO_3.

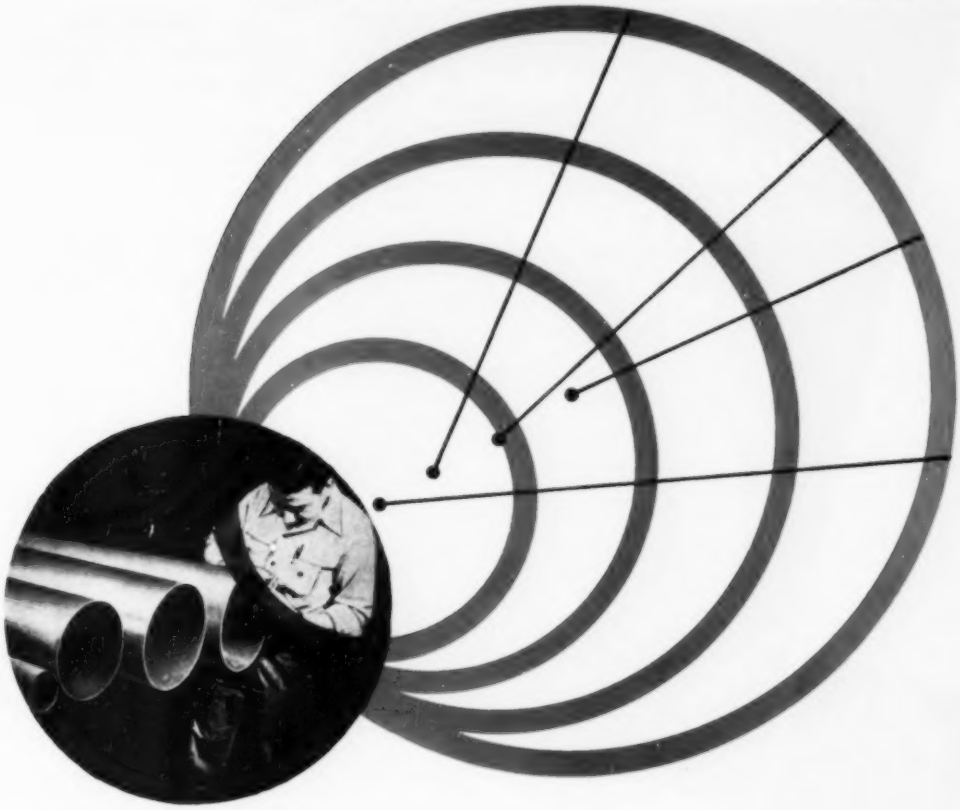
11405

PRODUCTS & SERVICES INCLUDE:
ELECTRICAL CONTACTS
SELENIUM RECTIFIERS
METALS: TANTALUM, TUNGSTEN
MOLYBDENUM, COLUMBIUM
COPPER BASE ALLOYS
RESISTANCE WELDING MATERIALS

Fansteel

☆ Acid-Proof TANTALUM CHEMICAL PLANT EQUIPMENT ☆

AN INDUSTRY THAT SERVES INDUSTRIES



engineers who design for long life specify TRENTWELD

Here are 7 reasons why TRENTWELD is better

1. Largest variety of sizes—4½" to 30" inclusive
2. Finished tubing . . . machine-formed, machine-welded, machine-sized for uniformity
3. Made in a *tube* mill by *tube* experts
4. Made from tested cold rolled sheets . . . completely fused into finished tubing *without* added rod metal
5. No zone of weakness for corrosion to attack
6. Uniform section, metallurgically correct
7. Available for fabrication with any fittings

Trentweld Large Diameter (4½" to 30") Stainless Steel Tubing should not be compared to rolled up and hand welded sheets: Trentweld tubing is machine formed and machine welded without metal added. The weld is fused to the parent metal by an exclusive Trent development. That's what makes the difference, and that's why more and more fabricators, designers and manufacturers of all types of processing equipment are turning to Trent for their tubing requirements.

When you do business with Trent, you get top quality tubing PLUS engineering assistance to put stainless tubing to work in your application . . . better! Write for Trentweld Data Bulletin and tell us the application you have in mind.

TRENT TUBE COMPANY
Subsidiary of Crucible Steel Company of America
General offices and plant: East Troy, Wisconsin
Sales offices: Chicago—4501 W. Cortland Street; New York—Chrysler Building

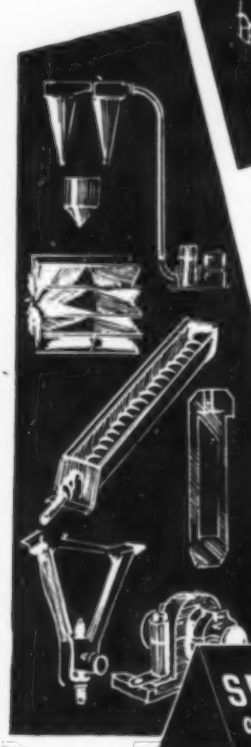
TRENTWELD

Visit Our Exhibit — Booths 634-635

STAINLESS STEEL TUBING

Guide & Directory Page 37

Is yours a problem of BULK MATERIALS HANDLING?



FOR conveying in process from bins, silos, ship holds or in and out of railway cars . . . whatever the job, as long as it's handling bulk materials, you can benefit from Sprout-Waldron experience and ingenuity.

Whether your materials be light or heavy, dense or bulky, fragile or abrasive, coarse or fine—whether your runs are short or long, horizontal or vertical, consult Sprout-Waldron.

Our facilities embrace a wide range of types and sizes in bucket elevators, belt conveyors, and screw conveyors. There's PNEU-VAC, too—a modern and truly remarkable means of conveying many materials via air.

For prompt consideration of your requirements, write
SPROUT, WALDRON & CO.,
15 Waldron St., Muncy, Pa.

VISIT OUR BOOTH at the CHEMICAL SHOW

SPROUT WALDRON
Manufacturing Engineers
MUNCY PENNSYLVANIA

Guide & Directory Page 38

EXHIBITORS Classified by Products

Ingersoll-Rand Co. (615–617)
Jeffrey Manufacturing Co., The (44A–45) Skip
Link-Belt Co. (715–717) Skip

HOMOGENIZERS

Chemicolloid Laboratories, Inc. (257)
Eppenbach, Inc. (278)
Fitzpatrick Co., The W. J. (401–402)
Knapp Mills, Inc.—Andrews-Knapp Construction Co., Inc. (23)
Lead Lined Iron Pipe Co.
Machlett & Son, E. (381 & A)
Manton Gaulin Manufacturing Co., Inc. (476)
Metal Glass Products Co., Inc. (425–426)
Patterson Foundry & Machine Co., The (707–708)
Premier Mill Corp. (312–314)
Rietz Manufacturing Co. (648)
Will Corp. (225–227) Laboratory
Bramley Machine Corp. (524–525)
Tri-Homo Corp. (626)

HOOD, FUME

Alberene Stone Corp. of Virginia (79)
Aloe Co., A. S. (720)
Aluminum Co. of America (70–71)
American Hard Rubber Co., (303–305) Fume, (Rubber Lined)
Bartlett & Snow Co., The C. O. (427–428)
Day Co., The (450)
Fisher Scientific Co.—Eimer & Amend (57)
Fletcher Works, Inc. (33) for Centrifugals
General Ceramics & Steatite Corp. (2)
Haveg Corp. (51)
Heil Process Equipment Corp. (539) Rubber Lined, Lead Lined
Johns-Manville (93–94)
Kewanee Manufacturing Co. (308–310)
Knapp Mills, Inc.—Andrews-Knapp Construction Co., Inc. (23)
Lead Lined Iron Pipe Co.
Koven & Brother, Inc., L. O. (304–306)
Laboratory Furniture Co., Inc. (221–223)
Sjostrom Co., John E. (664)

HUMECTANTS

Atlas Powder Co. (46–47)

HUMIDIFYING APPARATUS

American Instrument Co., Inc. (385–387)
Electric Hotpack Co., Inc., The (655–656)
Grinnell Co., Inc. (251)
Koch Engineering Co., Inc. (479–480)
Machlett & Son, E. (381–A)
Niagara Blower Co. (233–235)

INDICATORS

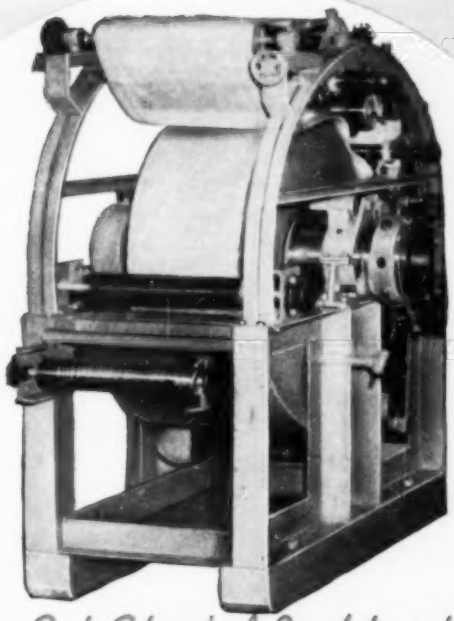
Bailey Meter Co. (56)
Builders-Providence, Inc. (493–495)
Denver Equipment Co. (507)
Energy Control Co., Inc. (722)
Exact Weight Scale Co., The (472–473)
Fischer & Porter Co. (203–207) Aircraft, Air Velocity, Magnetic Remote Indicating, Sight Flow
Hart-Moisture-Meters (680) Moisture
Jacoby-Tarbox Corp. (540–542) — Henry E. Jacoby
Jeffrey Manufacturing Co., The (44A–45) Bin Level
Jerguson Gage & Valve Co. (514) Level
Machlett & Son, E. (381 & A)
Magnetrol, Inc. (724)
Reliance Electric & Engrg. Co. (674–675)

NEW PILOT PLANT FILTER

WITH *Interchangeable String or Scraper* DISCHARGE

Here, for the first time, is a pilot plant filter equipped with both the famous FEinc String Discharge and standard scraper discharge—quickly convertible to either type for handling *any* continuous filtering operation. The String Discharge, originated by Filtration Engineers Inc., handles difficult cakes—even thin slimes—cleanly, efficiently, and with longer cloth life. Ideal for small scale or temporary production, the FEinc Pilot Plant Filter has 3 ft. drum dia. and 1 ft. drum width. Quality built of type 316 stainless steel. Also includes famous FEinc washing and compression dewatering mechanisms.

Rental-Purchase Plan: Rent it by the month, with half rent for first month to allow for time lost in start-up. If you later purchase this, or any full-scale FEinc filter, you get generous credit allowance—*plus* continued success in your filtration operations.



Original FEinc String Discharge . . .

. . . interchangeable to standard Scraper Discharge

Send for Bulletin 101

Get Started Right with a

FEinc PILOT PLANT FILTER

FILTRATION ENGINEERS INC., 155 ORATON STREET, NEWARK 4, N. J.

Guide & Directory Page 39

(No. 7)

How Activated Carbon Is Used—Granular Carbon

Granular carbon is used where large volumes of liquids with low impurity content are processed. Example: the purification of water by beverage manufacturers. The liquid should be completely free of suspended matter; otherwise, the granules quickly become fouled and their adsorptive capacity soon impaired.

When using granular carbon, contact efficiency is no problem because the liquid comes in such intimate contact with such a large bulk of carbon. Contact time is determined by the rate of flow and the bed depth. Other variables are direction of flow and temperature.

Beds of granular carbon range from 24" to 72" in depth but rarely exceed 36". Rates of flow normally range from 0.2 to 1.0 gallons per minute per cubic foot. Temperatures are usually low because of the difficulty of heating large volumes of liquid.

Highly activated carbon is electropositive toward metals—metal filter shells should be coated with an inert material to prevent corrosion.

DARCO

DARCO—REG. U.S. PAT. OFF.

DARCO CORPORATION

60 East 42nd St., New York 17, N.Y.

Meet us at the "Chem Show"! Learn more about what

DARCO

can do in purifying solvents and other chemical solutions, and how it fits into your processes. Let's talk it over at Booth 46-47 Grand Central Palace New York City November 28 to December 3

Guide & Directory Page 40

EXHIBITORS Classified by Products

Minneapolis-Honeywell Regulator Co.—Brown Instrument Div. (40–41) Temperature, Pressure, Flow, Liquid Level
National Technical Laboratories (265–269) pH
Rosevear Co., M. B. (602)
Schutte & Koerting Co. (291) Flow
Uehling Instrument Co. (356) Liquid Level, Draft, Vacuum, Pressure, Absolute Pressure Indicators
Wallace & Tiernan Co., Inc. (519–521)
Weston Electrical Instrument Corp. (263)

INSTRUMENTS, OPTICAL

Aloe Co., A. S. (720)
American Instrument Co., Inc. (385–387)
Baird Associates, Inc. (669–670)
Fisher Scientific Co.—Simer & Amend (57)
Gamma Scientific Co. (497)
General Laboratory Supply Co. (711)
Machlett & Son, E. (381 & A)
National Technical Laboratories (265–269)
Perkin-Elmer Corp. The (567–568)
Process & Instrument (518)
Thomas Co., Arthur H. (665–666)
Welch Manufacturing Co., W. M. (405–406)
Will Corp. (225–227)

INSTRUMENTS, PRECISION

American Instrument Co., Inc. (385–387)
Cambridge Instrument Co., Inc. (330–332)
Consolidated Engineering Corp. (703–704)
Engelhard Inc., Charles (456)
Fischer & Porter Co. (203–207) Flow Rate
General Electric Apparatus Dept. (4)
Greiner Co., The Emil (226–228)
Macbeth Corp. (201)
Machlett & Son, E. (381 & A)
Minneapolis-Honeywell Regulator Co.—Brown Instrument Div. (40–41) Industrial Instruments of Non-Indicating, Indicating, Recording & Controlling Types for Temperature, Pressure, Humidity, Flow, Liquid Level & pH
National Technical Laboratories (265–269)
New York Laboratory Supply Co., Inc. (218)
Photovolt, Corp. (270–272)
Process & Instrument (518)
Rosevear Co., M. B. (602)
Seederer-Kohlbusch, Inc. (389)
Technicon Chromatography Corp. (712)
Thomas Co., Arthur H. (665–666)
Toledo Scale Co. (44B)
Uehling Instrument Co. (356)
Wallace & Tiernan Co., Inc. (519–521)
Welch Manufacturing Co., W. M. (405–406)
Weston Electrical Instrument Corp. (263)

INSTRUMENTS, TESTING

American Instrument Co., Inc. (385–387)
Barnstead Still & Sterilizer Co. (299–231)
Brabender Corp. (289) Plastometers—Viscometers—Moisture Testers
Carver Inc., Fred S. (237)
Consolidated Engineering Corp. (703–704)
Energy Control Co., Inc. (722)

the adolescent stage has passed

for stainless sheet and strip

Stainless steel production methods have grown up, thanks to modern advances in strip mill practice. CRUCIBLE, for generations *the* name in specialty steels, has taken all prior development of stainless steel an $18,000,000 step ahead. At the Midland Works, stainless for the *first time* is made a *specialty product* in an all-new mill built *specifically* for stainless production. In this modern project, every building, every piece of equipment has been designed to make use of the best industry-tested techniques plus exclusive features designed by Crucible's steel specialists.

Here at this new mill stainless sheet and strip will be rolled in widths of ½" to 50" inclusive, in all gauges, grades and finishes. Crucible's latest contribution rounds out an integrated program in stainless. Now every form is available from Crucible: sheets, strip, plates, bars, wire, forgings, castings and tubing (manufactured by the new subsidiary, Trent Tube Company). When you ask for Crucible Stainless, you're assured of the finest that modern tools and a half century of specialty steel experience can offer. Data sheets on request. Your inquiries will receive prompt attention.

CRUCIBLE STEEL COMPANY OF AMERICA
405 Lexington Ave., New York 17, N. Y.
Branches, Warehouses and Distributors in Principal Cities

VISIT OUR EXHIBIT—BOOTHS 634, 635

CRUCIBLE first name in special purpose steels

hot and cold rolled **STAINLESS SHEET AND STRIP**

STAINLESS • HIGH SPEED • TOOL • ALLOY • MACHINERY • SPECIAL PURPOSE • STEELS

Guide & Directory Page 41

(No. 7)

How Activated Carbon Is Used—Granular Carbon

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Uehling Instrument Co. (356) Liquid Level, Draft, Vacuum, Pressure, Absolute Pressure Indicators
Wallace & Tiernan Co., Inc. (519–521)
Weston Electrical Instrument Corp. (263)

INSTRUMENTS, OPTICAL

Aloe Co., A. S. (720)
American Instrument Co., Inc. (385–387)
Baird Associates, Inc. (669–670)
Fisher Scientific Co.—Simer & Amend (57)
Gamma Scientific Co. (497)
General Laboratory Supply Co. (711)
Machlett & Son, E. (381 & A)
National Technical Laboratories (265–269)
Perkin-Elmer Corp. The (567–568)
Process & Instrument (518)
Thomas Co., Arthur H. (665–666)
Welch Manufacturing Co., W. M. (405–406)
Will Corp. (225–227)

INSTRUMENTS, PRECISION

American Instrument Co., Inc. (385–387)
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Consolidated Engineering Corp. (703–704)
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Fischer & Porter Co. (203–207) Flow Rate
General Electric Apparatus Dept. (4)
Greiner Co., The Emil (226–228)
Macbeth Corp. (201)
Machlett & Son, E. (381 & A)
Minneapolis-Honeywell Regulator Co.—Brown Instrument Div. (40–41) Industrial Instruments of Non-Indicating, Indicating, Recording & Controlling Types for Temperature, Pressure, Humidity, Flow, Liquid Level & pH
National Technical Laboratories (265–269)
New York Laboratory Supply Co., Inc. (218)
Photovolt, Corp. (270–272)
Process & Instrument (518)
Rosevear Co., M. B. (602)
Seederer-Kohlbusch, Inc. (389)
Technicon Chromatography Corp. (712)
Thomas Co., Arthur H. (665–666)
Toledo Scale Co. (44B)
Uehling Instrument Co. (356)
Wallace & Tiernan Co., Inc. (519–521)
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for stainless sheet and strip

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Here at this new mill stainless sheet and strip will be rolled in widths of ½" to 50" inclusive, in all gauges, grades and finishes. Crucible's latest contribution rounds out an integrated program in stainless. Now every form is available from Crucible: sheets, strip, plates, bars, wire, forgings, castings and tubing (manufactured by the new subsidiary, Trent Tube Company). When you ask for Crucible Stainless, you're assured of the finest that modern tools and a half century of specialty steel experience can offer. Data sheets on request. Your inquiries will receive prompt attention.

CRUCIBLE STEEL COMPANY OF
405 Lexington Ave., New
Branches, Warehouses and

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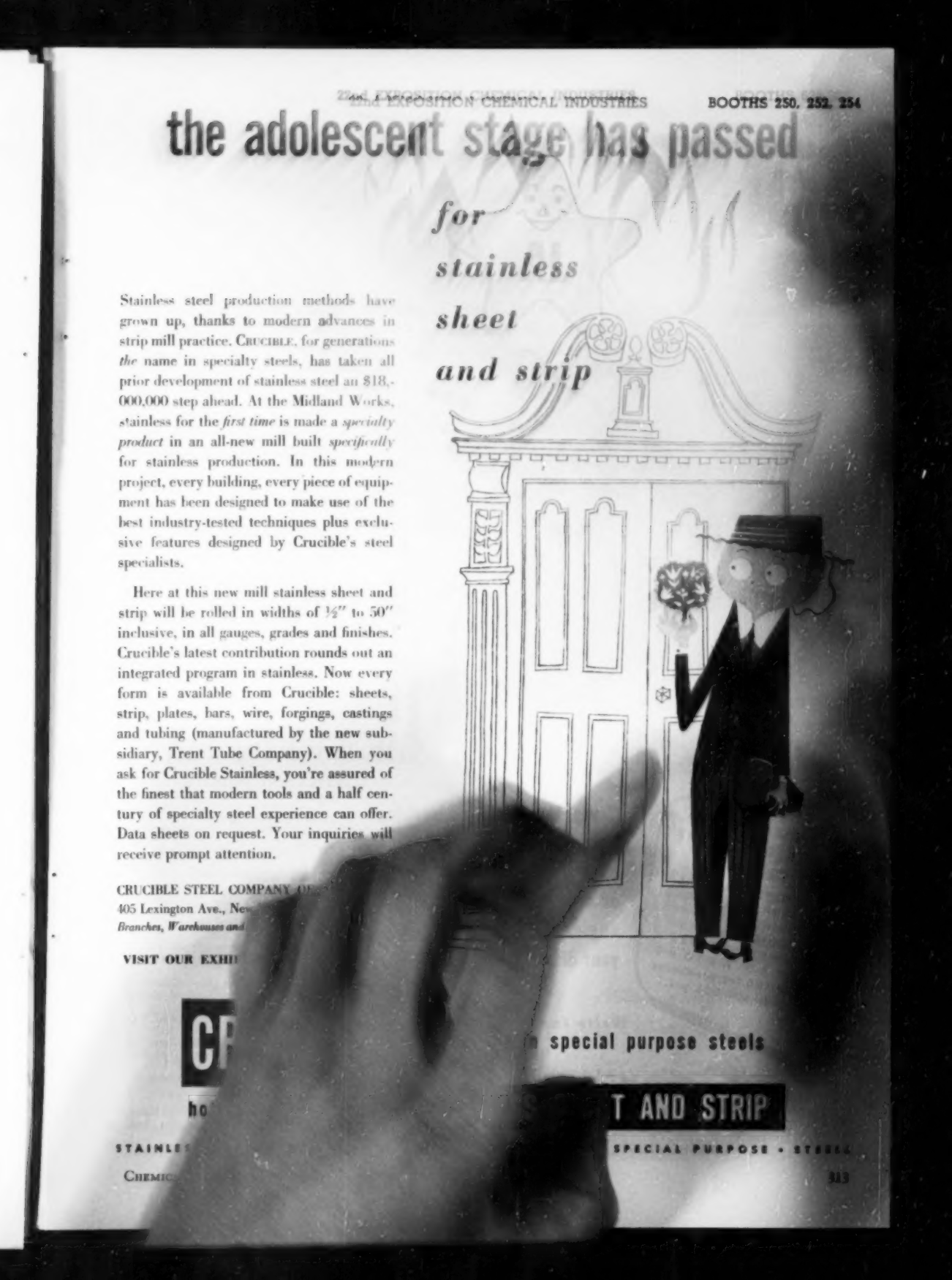

special purpose steels

T AND STRIP

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SPECIAL PURPOSE • STEEL

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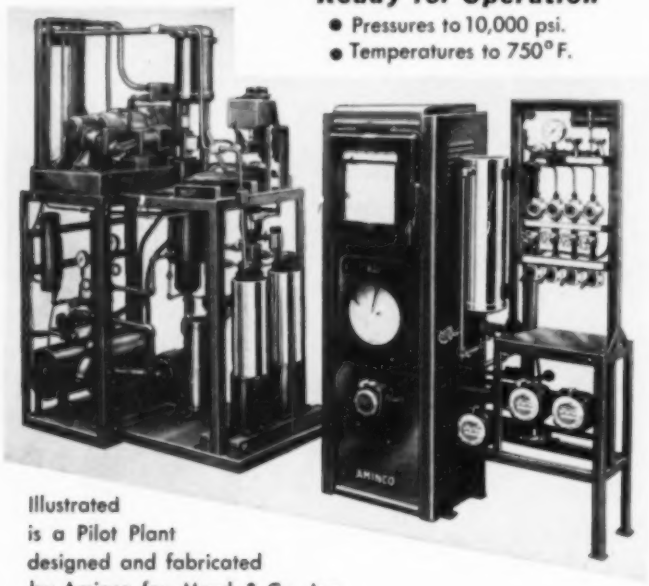
PILOT PLANTS

FOR THE SYNTHESIS OF COMPOUNDS AT HIGH PRESSURES & TEMPERATURES

Engineered & Fabricated as Packaged Units --- Ready for Operation

- Pressures to 10,000 psi.
- Temperatures to 750° F.



Illustrated is a Pilot Plant designed and fabricated by Aminco for Merck & Co., Inc.

OTHER AMINCO SUPERPRESSURE PRODUCTS

- REACTION VESSELS
- VALVES • FITTINGS
- TUBING • PUMPS
- COMPRESSORS
- INSTRUMENTS
- DEAD-WEIGHT GAGES for pressures up to 100,000 psi.

If you have problems involving high pressure hydrogenation oxo reactions, and other types of organic synthesis, Aminco engineering facilities are at your disposal.

Write for catalogue 406 D

AMINCO *Superpressure Division*
AMERICAN INSTRUMENT CO.
8010 GEORGIA AVENUE · SILVER SPRING, MARYLAND

Guide & Directory Page 42

EXHIBITORS

Classified by Products

Engelhard Inc., Charles (456)
Gamma Scientific Co. (497)
General Electric Apparatus Dept. (4)
Greiner Co., The Emil (226-228)
Hart-Moisture-Meters (680)
Illinois Testing Laboratories, Inc. (38-39)
Industrial Instruments, Inc. (410)
Macbeth Corp. (201)
Machlett & Son, E. (381 & A)
Martindale Electric Co. (440)
National Technical Laboratories (265-269)
New York Laboratory Supply Co., Inc. (218)
Perkin-Elmer Corp., The (567-568)
Photovolt Corp. (270-272)
Process & Instrument (518)
Rosevear Co., M. B. (602)
Scientific Glass Apparatus Co., Inc (215-219)
Thomas Co., Arthur H. (665-666)
Uehling Instrument Co. (356)
Welch Manufacturing Co., W. M. (405-406)
Weston Electrical Instrument Corp. (263)
Will Corp. (225-227)

INSULATING MATERIAL—HEATING, ELECTRIC AND MOLDED

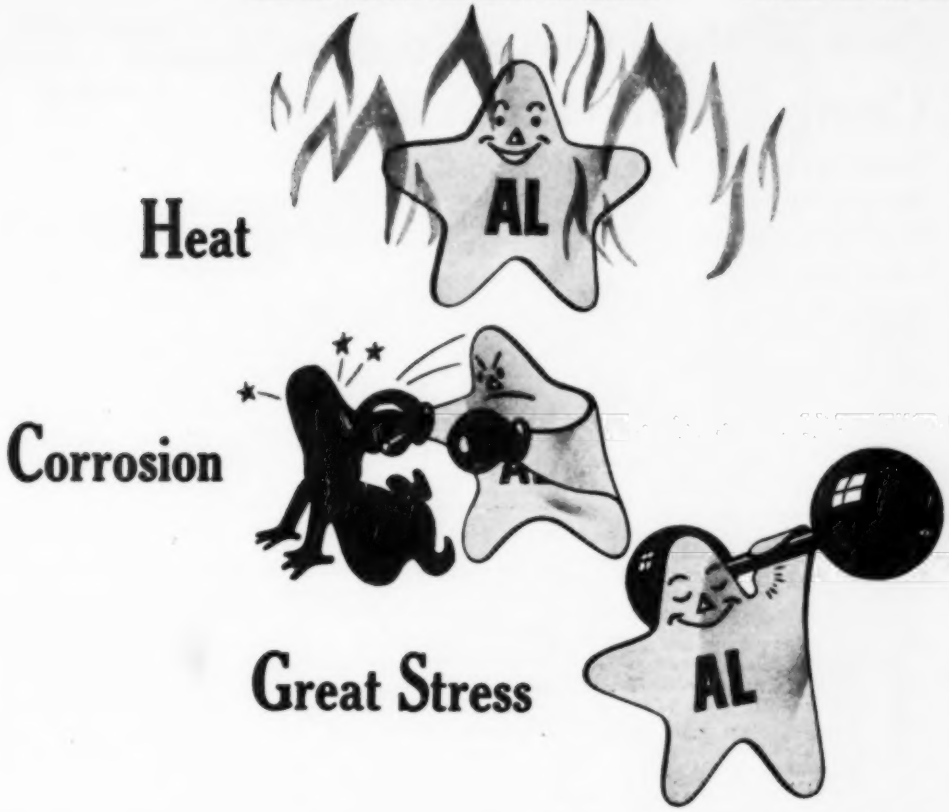
Aluminum Co. of America (70-71)
Eagle-Picher Sales Co. (678-679)
Haveg Corp. (51) Electric
Johns-Manville (93-94)
Luzerne Rubber Co., The (528-529) Hard Rubber—Electric & Molded
Norton Co. (415-416)
Pittsburgh Corning Corp. (643) Foamglas, Insulation (Cellular Glass) for Buildings, Process Equipment and Piping
St. Regis Sales Corp. (530-532)
Titanium Alloy Manufacturing Div.—National Lead Co. (366-368)
Owens-Illinois Glass Co.—Kaylo Div. (281)

INSULATION, FURNACE

Dicalite Div.—Great Lakes Carbon Corp. (86)
Johns-Manville (93-94)
Owens-Illinois Glass Co.—Kaylo Div. (281)

KETTLES (KIND)

Aluminum Co. of America (70-71)
American Hard Rubber Co. (303-305) Rubber Lined
Ampco Metal, Inc. (268) Made to Order
Blaw-Knox Co. (13-14) Resin
Blickman Inc., S. (474-475) Stainless & Alloy
Buflovak Equipment Div.—Blaw-Knox Co. (6) Processing, Jacketed—Direct Fired-Grease-Mixing
Eppenbach, Inc. (278) Steam, Gas, Electric
General Ceramics & Steatite Corp. (2)
Glascote Products, Inc. (657-658) Stoneware—Glass Lined & Alloy
Goslin-Birmingham Manufacturing Co., Inc. (74)
Haveg Corp. (51)
Knapp Mills, Inc.—Andrews-Knapp Construction Co., Inc. (23) Lead Lead Lined Iron Pipe Co.
Knight, Maurice A. (53) Acid Proof



—they all look alike to ALLEGHENY METAL

BOOTHS 250 to 254
contain the
ALLEGHENY LUDLUM EXHIBIT
at the
CHEMICAL EXPOSITION

★

A large group of our engineers and researchers will be there to help you find stainless steel answers to your processing problems.

WE'LL WELCOME YOUR CALL

A lifetime servant that can stand up to your job—practically under *any* conditions of heat, corrosion and wear—that's what you get when you specify Allegheny Metal. Great strength and resistance to chemical or atmospheric corrosion . . . rugged ability to take a beating . . . bright, shining beauty and endless ease of cleaning . . . they're all yours with this time-tested stainless steel.

Your first cost is practically your last, too. The odds are that no other metal can do your job quite as well as stainless steel. No other metal looks or lasts quite as well while doing it. And certainly no other metal offers more in the way of cutting maintenance and depreciation costs!

● If your equipment has to take it on the chin in countless ways, *insist* on Allegheny Metal—the pioneer stainless steel—*it has what you need!*

ALLEGHENY LUDLUM STEEL CORPORATION
Pittsburgh, Pa.

Nation's Leading Producer of Stainless Steels in All Forms

AL

W&D 1679

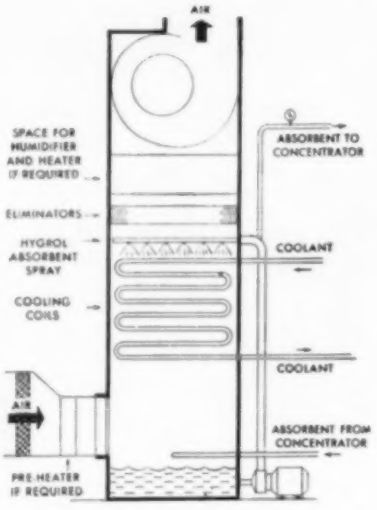
ALLEGHENY METAL is stocked by all Joseph T. Ryerson & Son, Inc. warehouses

Guide & Directory Page 43

New Method Gives Precise Control in Air Conditioning

Niagara "Controlled Humidity Method" Uses Hygrol, Hygienic Liquid Absorbent

● The Niagara "Controlled Humidity Method" is a new system of air conditioning giving complete control of temperature and relative humidity, holding constant conditions or varying them at the will of the user. Especially, it provides dry air at normal atmospheric temperatures with little or no refrigeration required. A condition of 15 grains of moisture per pound of air at 85 deg. F. dry bulb temperature has been produced without refrigeration.



NIAGARA CONTROLLED HUMIDITY METHOD — FLOW DIAGRAM

The apparatus is enclosed in a casing thru which the air is drawn by fans. The air is filtered and then enters a chamber where it is dehumidified in passing thru a spray of "Hygrol" Liquid (a hygienic hygroscopic chemical that absorbs the air-borne moisture and contains no salts or solids to precipitate). In the same chamber are located cooling coils which remove the latent heat of evaporation and also do any sensible heat removal that may be needed. The air stream then passes through entrained moisture eliminators and is diffused in the space to be conditioned.

The absorbent liquid spray falls into a tank at the base, from which it is piped to a concentrator which removes the moisture taken from the air. The re-concentrated liquid returns to the system. This process is continuous, and the apparatus operates at full capacity at all times.

The same equipment may be used to provide winter air conditioning when required, by installing a tempering coil at the outdoor intake, an humidifier, and a reheat coil above the eliminators.

This equipment is manufactured in a range of sizes providing from 1000 to 20,000 CFM of conditioned air from a single unit, and mutiple unit installations are practical. It is expected that, by reducing the need for refrigeration, the cost of air conditioning will be reduced by this method. Applications generally are in a temperature range from 35 deg. F. upward. Below the freezing temperature of water, the Niagara "No-Frost" method is applicable.

The equipment is protected by U. S. and foreign patents. Installations have been made in food and chemical process industries, in packaging hygroscopic products, for preventing condensation of moisture on metals and other products in storage, in air conditioning for laboratory control and for human comfort.

For further information, write the Niagara Blower Company, 405 Lexington Ave., New York 17, N. Y.

Operation of the Niagara "Controlled Humidity Method" Will Be Demonstrated at Booths 233 and 235

22nd EXPOSITION OF CHEMICAL INDUSTRIES
Nov. 28 to Dec. 3, 1949
Grand Central Palace
NEW YORK CITY

EXHIBITORS Classified by Products CONTINUED

Koven & Brother, Inc., L. O. (304–306) Welded—Open Top (All Shapes & Designs) — Pressure — Vacuum — in Stainless Steel, Monel, Steel, Stainless Steel Clad & all standard Metals, Portable & Stationary-Jktd.
Metal Glass Products Co., Inc. (425–426) Stainless Steel-Jacketed
Moore Co., J. Arthur (512–513) Glass Lined
New England Tank & Tower Co. (50) Agitated
Patterson Foundry & Machine Co., The (707–708)
Patterson-Kelley Co., Inc. (274–276)
Pfaudler Co., The (72–73)
Rodgers Co., George G. (612) Stainless
Selas Corp. of America (533–534)
Trent, Incorporated (526–527) Electric—Varnish, Pitch, Wax
Union Iron Works (431) Paint Mixing, Synthetic Resin, Hydrogenation Set Kettles (Direct Fired), Steam Heated, Electrically Heated, Cooking
U. S. Stoneware Co., The (89–91) Stoneware & Porcelain
Stokes Machine Co., F. J. (86) Vacuum

KILNS

Allis-Chalmers Manufacturing Co. (48–49) Rotary
Buflovak Equipment Div.—Blaw-Knox Co. (6)
Electric Hotpack Co., Inc., The (655–656) Electric-Laboratory
General American Transportation Corp. (285–287)
Selas Corp. of America (533–534)
Union Iron Works (431) Rotary
Bartlett & Snow Co., The C. O. (427–428)

LABORATORY APPARATUS AND SUPPLIES

Luzerne Rubber Co., The (528–529) Hard Rubber
Machlett & Son, E. (381 & A)
Mixing Equipment Co., Inc. (307–309 & 334–336)
National Technical Labs. (265–269)
Newark Wire Cloth Co. (83–84)
New York Laboratory Supply Co., Inc. (218)
Norton Co. (415–416) Ware
Palo-Myers, Inc. (642)
Patterson Foundry & Machine Co., The (707–708)
Precision Scientific Co. (701–702)
Premier Mill Corp. (312–314)
Process & Instrument (518)
Pulverizing Machinery Co. (300–302)
Republic Seitz Filter Corp. (557)
Rosevear Co., M. B. (602)
Roy Co., Milton (432–433) Apparatus
Scientific Glass Apparatus Co., Inc. (215–219)
Seederer-Kohlbusch, Inc. (389)
Selas Corp. of America (533–534)
Standard Scientific Supply Corp. (618)
Sturtevant Mill Co. (3)
Superior Electric Co., The (522–523)
Technicon Chromatography Corp. (712)
Thomas Co., Arthur H. (665–666)
Tyler Co., The W. S. (88)
U. S. Stoneware Co., The (89–91)
Welch Mfg. Co., W. M. (405–406)
Weston Electrical Instrument Corp. (263)
Wiegand Co., Edwin L. (601)
Richmond Mfg. Co. (519)

Ask the Man who has Bought More Than One...

Cowles ULTRA-FAST DISSOLVER

He'll tell you that the Cowles method is 2 to 20 times FASTER on tough dissolving and dispersing jobs.

Cowles Tank Type Dissolver
with stationary tank. Available with heat exchanger in the base. Capacities of 100, 250 & 500 gal.

Yes—35% of our recent sales have gone to companies that have bought again and again. Companies that had tried, owned and operated Cowles Ultra-Fast Dissolvers in their own plants . . . on their own materials . . . with their own operators. And they were so pleased that they came back for more machines—some even replacing newly-installed equipment with Cowles Dissolvers.

Let us demonstrate on YOUR materials

Below is a record of comparative operating times on standard commercial processes. In every case the Cowles Dissolver consistently outperforms other types, saving in some instances up to 46½ hours. Such a wide difference in operating times challenges belief, we know. So don't just accept these figures; let us show you what the Cowles Ultra-Fast Dissolver can do on *your* materials. There's no cost, no obligation. Just write or wire . . .

Cowles Model 5VT Tilted

Engineered to the job

Standard dissolvers employing the Cowles Method are available in 4 different types, each specially adapted in motor speed, horsepower, impeller and chemical inertness of tank to the physical and chemical properties of the materials being treated. But special designs to fit special processes are regularly produced under reasonable delivery-date schedules. Let our engineers study your needs and make a recommendation. You may find your problem simpler than you think.

Cowles Model 20D-2
Impeller elevates 54" and swings in an 180° arc for line processing in containers brought to the machine.

Cowles Model 10D-1
(not illustrated)
Impeller elevates 38" and swings in a 90° arc. Will process from 5 to 200 gallons per batch, depending upon characteristics of materials used.

7 YEARS OF COMMERCIAL TEST SHOW COWLES DISSOLVER UP TO 46½ HOURS FASTER ON TYPICAL OPERATIONS

Type Operation	Material	Cowles Dissolver	Standard Mixer
Gum Cutting	Resin	1½ Hrs.	12 Hrs.
Synthetic resin dissolving	Vinylite	1 Hr.	6 Hrs.
N/C solution	Nitrocellulose	12 Min.	90 Min.
Washing	Scrap Film	1½ Hrs.	48 Hrs.
Pigment dispersion	Heavy Enamel	6 Min.	150 Min.
Coating suspension	H. T. Clay	1 Hr.	9 Hrs.

The Cowles Company
INCORPORATED
22 TRACKSIDE, CATUGA, N. Y.

Associate: Alexander Flock, Ltd., Ottawa, Ont.

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Have You determined whether or not SPRAY DRYING will solve your drying requirement at lower cost?

BOWEN TEST FACILITIES ARE AVAILABLE NOW AT LOW RATES

The results of over 20 years intensified Spray Drying research by Bowen is available to help you produce a better product. And facilities for testing include our standard laboratory dryer for preliminary runs and a full scale production Spray Dryer for sample lot and tonnage production.

BOWEN DESIGNS A COMPLETE LINE OF SPRAY DRYERS

Laboratory TO *High Tonnage Production*

WRITE TODAY FOR FULLY ILLUSTRATED LITERATURE

BOWEN ENGINEERING, INC.

NORTH BRANCH 4 NEW JERSEY

Recognized Leader in Spray Dryer Engineering ... Since 1926

BOWEN

EXHIBITORS • Classified by Products

Will Corp. (225–227)
Corning Glass Works (391–395) Glass
Stokes Machine Co., F. J. (80)

LABELING MACHINES

Economic Machinery Co. (545–546)
Fitzpatrick Co., The W. J. (401–402)
New Jersey Machine Corp. (485–486)
Norton Co. (415–416)
Pneumatic Scale Corp. Ltd. (22)

LABORATORIES, TESTING

Buflovak Equipment Div.—Blaw-Knox Co. (6)
Denver Equipment Co. (507)
Great Western Manufacturing Co. (372–374)
Machlett & Son, E. (381 & A)
Snell Inc., Foster D. (37)

LABORATORY APPARATUS AND SUPPLIES

Ace Glass, Incorporated (383)
Aloe Co., A. S. (720)
American Instrument Co., Inc. (385–387)
Amersil Co., Inc. (454–455)
Barnstead Still & Sterilizer Co., (229–231)
Bowen Engineering, Inc. (400–400A)
Carver Inc., Fred S. (237)
Combustion Engineering—Superheater Inc.—Raymond Pulverizer Div. (67) Laboratory Mills, Laboratory Mechanical Separators (Air)
Denver Equipment Co. (507)
Eastern Industries, Inc. (220–222–224) Stirrers, Midget Pump, Temperature Regulator
Eimco Corp., The (604–606)
Electric Hotpack Co., Inc., The (655–656)
Fisher Scientific Co.—Eimer & Amend (57)
Fletcher Works, Inc. (33) Apparatus
Gamma Scientific Co. (497)
General Laboratory Supply Co. (711)
Great Western Manufacturing Co. (372–374)
Greiner Co., The Emil (226–228)
Hart-Moisture-Meters (680)
Hercules Filter Corp. (443–445)
Kimble Glass Div. of Owens-Illinois Glass Co. (342–344) Apparatus
Knapp Mills, Inc.—Knapp, Andrews-Knapp Construction Co., Inc. (23) Lead Lined Iron Pipe Co.

LABORATORY FURNITURE

Alberene Stone Corp. of Virginia (79) Table Tops—Soapstone Table Tops—Laboratory
Aloe Co., A. S. (720)
Aluminum Co. of America (70–71)
Blickman Inc., S. (474–475)
Fisher Scientific Co.—Eimer & Amend (57)
Kewanee Manufacturing Co. (308–310)
Laboratory Furniture Co., Inc. (221–223)
Metalab Equipment Corp. (462–464)
Sheldon & Co., E. H. (255)
Sjostrom Co., John E. (664)
Welch Manufacturing Co., W. M. (405–406)

LACQUERS

American Resinous Chemicals Corp. (35–36)
Hercules Powder Co. (7W) Resins
U. S. Stoneware Co., The (89–91)

LAMPS

General Electric Apparatus Dept. (4)
Macbeth Corp. (201)
Machlett & Son, E. (381 & A)
Rosevear Co., M. B. (602) Infra-Red
Will Corp. (225–227)

LEAD BURNING AND COATING

Heil Process Equipment Corp. (539) Homogeneous Bonding
Knapp Mills, Inc.—Andrews-Knapp Construction Co., Inc. (23)
Lead Lined Iron Pipe Co. (23)
U. S. Stoneware Co., The (89–91)

LIME, CHEMICAL AND HYDRATED

Aluminum Co. of America (70–71)

LOADERS

Eimco Corp., The (604–606)
Gump Co., B. F. (362–364) Packers, Bag & Barrell
Link-Belt Co. (715–717)
National Engineering Co. (554–555)
Patterson Foundry & Machine Co., The (707–708) Car
Sprout, Waldron & Co., Inc. (550–553)

LUBRICATING SYSTEMS

Farval Corp. (502–503)

MAGNETIC SEPARATORS

Bartlett & Snow Co., The C. O. (427–428)
Eriez Manufacturing Co. (631–632)
Great Western Manufacturing Co. (372–374)
Jeffrey Manufacturing Co., The (44A–45)
Patterson Foundry & Machine Co., The (707–708)
Pulverizing Machinery Co. (300–302)
Richmond Mfg. Co. (518)
Rietz Manufacturing Co. (648)
Separations Engineering Corp. (52)
Sprout, Waldron & Co., Inc. (550–553)
Wallace, & Tiernan Co., Inc. (519–521)

MASTICATORS

Patterson Foundry & Machine Co., The (707–708)
Rietz Manufacturing Co. (648)

MATERIALS HANDLING EQUIPMENT

Aluminum Co. of America (70–71)
Barrett-Cravens Co. (239–241)
Blickman Inc., S. (474–475)
Day Co., The (450) Pneumatic
Draeco Corp. (709–710)
Eriez Manufacturing Co. (631–632)
Falstrom Co. (510–511)
Gump Co., B. F. (362–364)
Jeffrey Manufacturing Co., The (44A–45)
Koven & Brother, Inc., L. O. (304–306)
Lawrence Machine & Pump Corp. (663)
Link-Belt Co. (715–717) Dumpers & Pullers (Car) Shakers (Car) Unloaders (Car)
Marsh Stencil Machine Co. (411) Stencil Machines-Electric & Hand Operated—Stencil Brushes (Fountain) Stencil Inks, Fountain Markers, Stencil Board
National Engineering Co. (554–555)
Richardson Scale Co. (659–660)
Rockwell Co., W. S. (447)
Sprout, Waldron & Co., Inc. (550–553)
Syntron Co. (311–313)
U. S. Stoneware Co., The (89–91)

METAL COATING AND PLATING

Aluminum Co. of America (70–71)

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THE NAME TO WATCH IN CHEMICALS

A PRIME SOURCE OF SUPPLY FOR:

Sodium Sulfonates
Polybutenes
Phthalic Anhydride
Detergents
Gas Odorants
Wetting Agents
Naphthenic Acids
Aliphatic Acid
Cresylic Acids
Lube Oil Additives

ORONITE CHEMICAL COMPANY

38 Sansome Street, San Francisco 4, Calif.
Standard Oil Bldg., Los Angeles 15, Calif.
30 Rockefeller Plaza, New York 20, N.Y.
600 S. Michigan Ave., Chicago 5, Illinois
824 Whitney Bldg., New Orleans 12, La.

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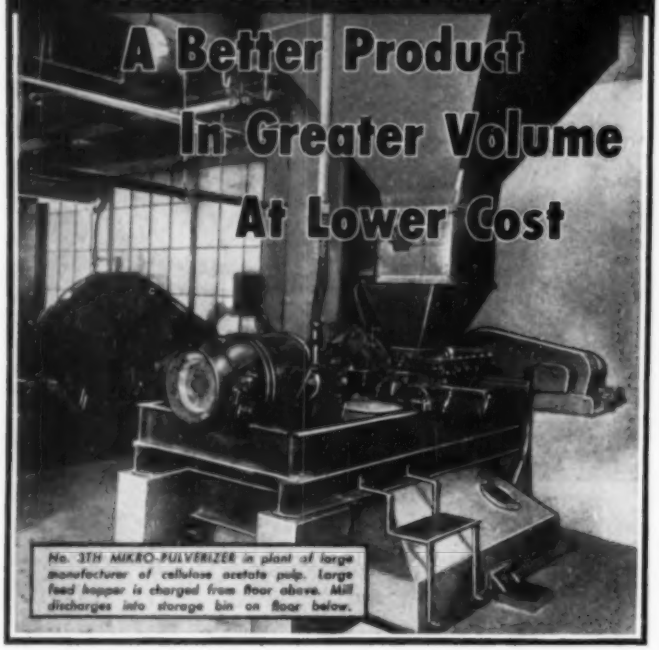
WHEREVER YOU FIND A MIKRO
There You Will Find---

A Better Product In Greater Volume At Lower Cost



No. 3TH MIKRO-PULVERIZER in plant of large manufacturer of cellulose acetate pulp. Large feed hopper is charged from floor above. Mill discharges into storage bin on floor below.

Let us show you how others have effected economies and improved their finished product through the use of MIKRO grinding and dust collecting equipment specially designed for the Chemical Processing Industry.

THE MIKRO PLAN FOR PROCESSING EFFICIENCY

If you have a pulverizing or dust control problem, our engineers will study it, telling you what our equipment and the MIKRO-Plan can do for you. There is no charge for this service which is based upon thousands of tests and performance records.

MIKRO-PULVERIZERS in six sizes
MIKRO-ATOMIZERS in three sizes
MIKRO-COLLECTORS in single or multiple-bag units

WRITE TODAY—for our new, illustrated catalog and information regarding our uncharged-for laboratory service to help you solve your pulverizing and dust collection problems.

VISIT OUR EXHIBIT
Booths 300 — 302 • New York Chemical Show
Nov. 28 — Dec. 3, 1949

PULVERIZING MACHINERY COMPANY
55 Chatham Road Summit, New Jersey

MIKRO-PULVERIZER (FINE) **-ATOMIZER** (ULTRA FINE)
Reg. U. S. Pat. Off.
Also Makers of the MIKRO-COLLECTOR

PRESERVE OUR HERITAGE: FAITH, FREEDOM AND INCENTIVE

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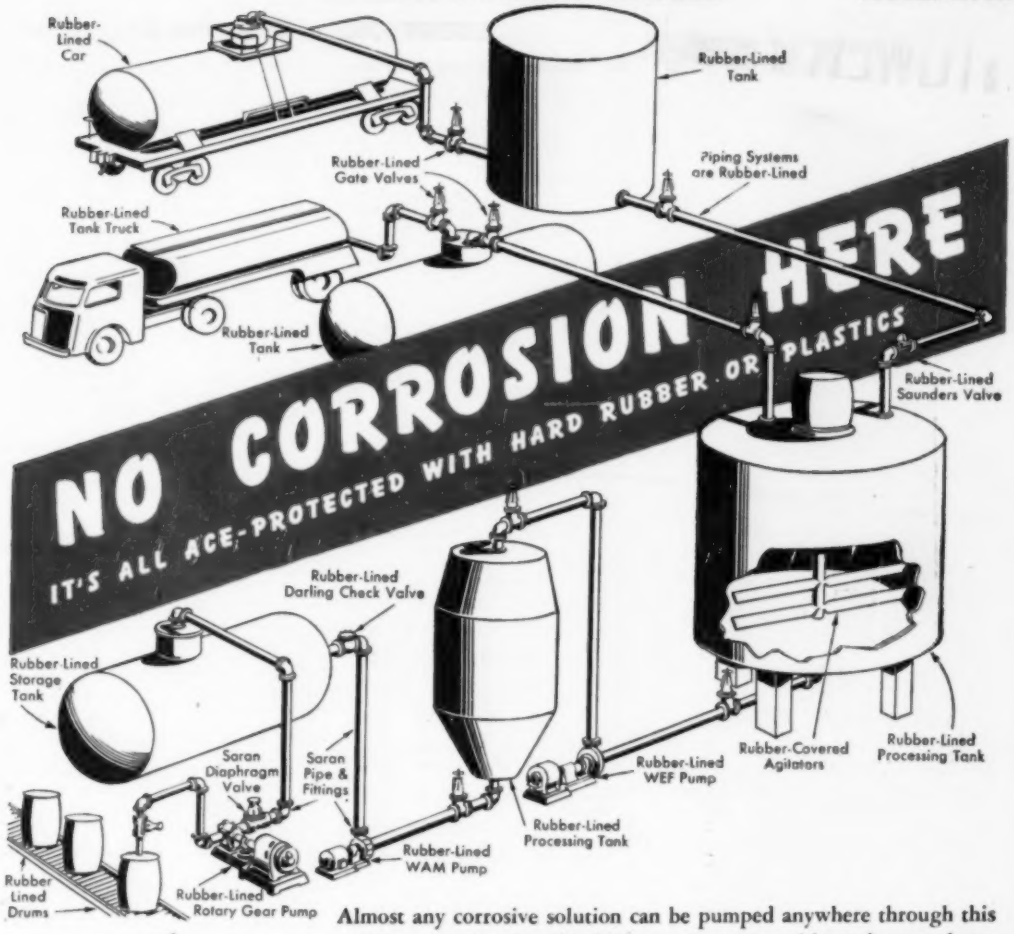
EXHIBITORS
Classified by Products

Baker & Co., Inc. (451–452)
Platecoil Div. Kold-Hold Mfg. Co. (726)
Lead Lined Iron Pipe Co. (23)
Lukens Steel Co. & Divisions By Products Steel Co. & Lukenweld (558–563) Clad Steels
Stokes Machine Co., F. J. (80)

METAL CONTAINERS
Aluminum Co. of America (70–71)
Continental Can Co., Inc.—Fibre Drum Section (243–245)
Falstrom Co. (510–511)
Greif Bros., The—Cooperage Corp.—Carpenter Corp. (261)
Industrial Steels, Inc. (649–650)
Knapp Mills, Inc.—Andrews-Knapp Construction Co., Inc. (23)
Lead Lined Iron Pipe Co. (23)
Metal Glass Products Co., Inc. (425–426) Stainless Steel
Pfaudler Co., The (72–73)
Pressed Steel Tank Co. (348–352)
Republic Steel Corp. (434–436)
U. S. Steel Corp. (76–77)

METALS
Allegheny Ludlum Steel Corp. (250–254) Sheet, Plate, Bars
Aluminum Co. of America (70–71)
American Platinum Works, The (457)
Ampco Metal, Inc. (268)
Burgess-Parr Co. (661)
Cooper Alloy Foundry Co., The (565–566) Stainless Steel, Nickel, Monel
Crucible Steel Co. of America (635) Stainless Steels
Eastern Stainless Steel Corp., The (573) Stainless Steel Sheets & Plates
Fansteel Metallurgical Corp. (282–284) Clad Metals-Tantalum
Haynes Stellite Co. (92)
Industrial Steels, Inc. (649–650) Sheet Metal
International Nickel Co., Inc., The (9–10)
Knapp Mills, Inc.—Andrews-Knapp Construction Co., Inc. (23)
Lead Lined Iron Pipe Co. (23)
Lukens Steel Co. & Divisions—By-Products Steel Co. & Lukenweld (558–563) Steel, Carbon & Low Alloy & Clad
National Lead Co. (247)
Pressed Steel Tank Co. (348–352) Stainless Steel, Nickel, Aluminum, Monel
Republic Steel Corp. (434–436) Steel
Titanium Alloy Manufacturing Div.—National Lead Co. (366–368)
U. S. Steel Corp. (76–77)
Baker & Co., Inc. (451–452) Precious
Makepeace Co., D. E. (453)

METERS (KIND)
Bailey Meter Co. (56) Flow
Barnstead Still & Sterilizer Co. (229–231) Purity Water
Buffalo Meter Co. (725) Volumetric Type for Liquids
Builders-Providence, Inc. (493–495) Flow
Energy Control Co., Inc. (722) Flow—Level—Temperature—Pressure
Fischer & Porter Co. (203–207) Aeronautical (to measure Flow) Air, Chemical Solution, Flow, Food Products, Gasoline & Oil, Remote Pneumatic
Bowser, Inc. (461A)



Make sure you have our free 64-page Catalog 330-7.

Almost any corrosive solution can be pumped anywhere through this system—even at reasonably high temperatures—without danger of corrosion because at no time does the liquid contact anything but the smooth, impervious surfaces of Ace hard or soft rubber linings or Ace solid hard rubber or plastics.

Behind this great variety of modern chemical equipment stands nearly a century of Ace research and experience in the solving of corrosion problems. Ace engineers know how to select and apply rubber and plastics that give you the chemical resistance, heat resistance, and mechanical strength your job requires.

SEE ACE AT BOOTH NO. 303-305

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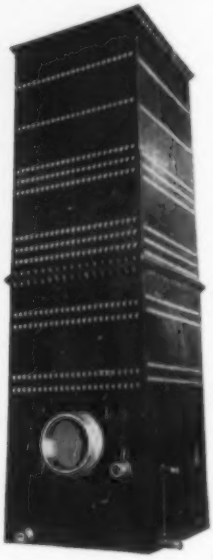
a TOWER of strength



CUTS PROCESS EQUIPMENT COSTS

Because HAVEG is so strong . . . so light in weight . . . it can cut the cost of huge towers like this. Used in handling corrosive acids, this cooler-absorber tower replaced a battery of smaller ones. Now efficiency of the entire operation is increased, and equipment costs are reduced.

If you need a material with high strength, toughness, durability plus 100% corrosion resistance, investigate HAVEG. This molded material is resistant to chemical action *throughout its entire mass*—not just on the surface. Large, structurally-strong equipment can be molded in one piece, at low cost, and delivered in from 1 to 8 weeks.

HA-5-49

HAVEG
CORPORATION
NEWARK 8, DELAWARE

EXHIBITORS • Classified by Products

Nordstrom Valve Div. Rockwell Mfg. Co., (25) Gas
Pittsburgh Equitable Meter Div. Rockwell Mfg. Co. (61)
Gamma Scientific Co. (497) pH
General Electric Apparatus Dept. (4) Electric
Hoke Incorporated (213) Flow
Machlett & Son, E. (381 & A)
National Technical Laboratories (265–269) pH Spectrophotometers-Radiation
%Proportioneers, Inc.% (477–478) Flow
Uehling Instrument Co. (356)
Welch Manufacturing Co., W. M. (405–406) Electric
Weston Electrical Instrument Corp. (263) Illumination
Will Corp. (225–227)
Cambridge Instrument Co., Inc. (330–332) pH

MICROSCOPES

Aloe Co., A. S. (720)
American Instrument Co., Inc. (385–387)
Fisher Scientific Co.—Eimer & Amend (57)
Gamma Scientific Co. (497)
General Laboratory Supply Co. (711)
Machlett & Son., E. (381 & A)
Precision Scientific Co. (701–702)
Scientific Glass Apparatus Co., Inc. (215–219)
Standard Scientific Supply Corp. (618)
Thomas Co., Arthur H. (665–666)
Welch Manufacturing Co., W. M. (405–406)
Will Corp. (225–227)

MILLS (KIND)

Allis-Chambers Manufacturing Co. (48–49) Grinding (Ball, Rod Compartment)
Chemicolloid Laboratories, Inc. (257) Colloid
Combustion Engineering—Superheater Inc.—Raymond Pulverizer Div. (67) Roller Mills & Imp Mills
Denver Equipment Co. (507) Concentrating
Eppenbach, Inc. (278) Pressure Feed
Goslin-Birmingham Manufacturing Co., Inc. (74)
Jeffrey Manufacturing Co., The (44A–45) Hammer
Machlett & Son, E. (381 & A)
Patterson Foundry & Machine Co., The (707–708) Pebble, Ball, Rod, Tube
Pulverizing Machinery Co. (300–302)
Pulverizing (Hammer)
Rietz Manufacturing Co. (648) Disintegrators
U. S. Stoneware Co., The (89–91)
Tri-Homo Corp. (626) Paint & Pigment-Grinding Mills

MINERALS

Aluminum Co. of America (70–71)
Denver Equipment Co. (507)
Dicalite Div., Great Lakes Carbon Corp. (86)
Foote Mineral Co., Inc. (607–608) Zirconium
Permutit Co., The (403–404)
Titanium Alloy Manufacturing Div.—National Lead Co. (366–368)

MIXING AND KNEADING MACHINERY

Alsop Engineering Corp. (293) Mixing
American Tool & Machine Co. (412)
Baker Perkins Inc. (62–63)
Blickman Inc., S. (474–475)
Buflovak Equipment Div.—Blaw-Knox Co. (6) Mixing
Colton Co., Arthur (719)
Cowles Co., Inc., The (572–575)
Day Co., The J. H. (718)
Eastern Industries, Inc. (220–222–224)
Eppenbach, Inc. (278)
Fletcher Works, Inc. (33) Mixing
General American Transportation Corp. (285–287)
Koven & Brother, Inc., L. O. (304–306) Open Top-Pressure (all Shapes and Designs); Vacuum—in any Commercial Metal. Portable or Stationary—any Type Drive or Speed Required
Link-Belt Co. (715–717) Flash
Mixing Equipment Co., Inc. (307–309 & 334–336)
National Engineering Co. (554–555)
New England Tank & Tower Co. (50)
Patterson Foundry & Machine Co., The (707–708)
Pfaudler Co., The (72–73)
Read Machinery Div. of The Standard Stoker Co., Inc. (280)
Rietz Manufacturing Co. (648)
Rodgers Co., George G. (612)
Separations Engineering Corp. (52) Mixing
Sprout, Waldron & Co., Inc. (550–553)
Sturtevant Mill Co. (3)
Turbo Mixer Corp. (285–287)
U. S. Stoneware Co., The (89–91)
Welding Engineers, Inc. (407–408)
Worthington Pump & Machinery Corp. (319–321) Mechanical Mixers
Bramley Machine Corp. (524–525) Mixers, Kneaders, Paint, Chocolate
Stokes Machine Co., F. J. (80)
Tri-Homo Corp. (626)

MOLDING MACHINERY

Carver Inc., Fred S. (237)
Great Western Manufacturing Co. (372–374)
Stokes Machie Co., F. J. (80)

MOTORS, ELECTRIC

Allis-Chalmers Manufacturing Co. (48–49)
Allis Co., Louis, The (320–322)
General Electric Apparatus Dept. (4)
Great Western Manufacturing Co. (372–374)
Link-Belt Co. (715–717) Gear
Machlett & Son, E. (381 & A)
Reeves Pulley Co. (34)
U. S. Electrical Motors Inc. (659A–662A)
Will Corp. (225–227) Laboratory
Reliance Electric & Engrg. Co. (674–675)

NAVAL STORES

Hercules Powder Co. (7W)

NITRATORS

Buflovak Equipment Div.—Blaw-Knox Co. (6)
General Ceramics & Steatite Corp. (2)
Knapp Mills, Inc.—Andrews-Knapp Construction Co., Inc. (23) Lead Lined Iron Pipe Co.
Knight, Maurice A. (53)
Patterson Foundry & Machine Co., The (707–708)
Pfaudler Co., The (72073)

NOZZLES, SPRAY

Link-Belt Co. (715–717)
Luzerne Rubber Co., The (528–529) Hard Rubber
Monarch Manufacturing Works, Inc. (354)
Schutte & Koerting Co. (291)

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Today, There's An Easier Way

. . . of Hunting Bear and Choosing Emulsifiers!

The new Atlas HLB system gives the industrial chemist a "rifle" method of choosing the right emulsifier for a particular job. No longer does he have to depend on blind-firing hit-or-miss "blunderbus" methods! Often, you can save hours—even weeks—of tedious experiments.

Based on empirical numbers representing the Hydrophile-Lipophile Balance of emulsifiers, the Atlas HLB system gives you a much-needed guide to the choice of the ideal surface active agents to fit most requirements. It may show that *your* requirements call for a custom-made emulsifier, which Atlas will formulate.

The Atlas HLB system of choosing emulsifiers is the first of its kind! You'll find it described in detail in the Atlas Surface Active Agents book. Send for your copy today—seventy formulas make it a handy reference guide in producing various emulsions.

ATLAS CHEMMUNIQUÉ

Swap ideas with us at the "Chem Show"

Our research and technical men will be there, talking your language, swapping ideas. So plan on visiting us at Booth 46-47 in Grand Central Palace, New York City, during the 22nd Exposition of Chemical Industries, November 28th to December 3rd. Here are some of the points you may want to discuss with us:

Sorbitol and Mannitol

For moisture conditioning, plasticizing—for manufacturing ingredients in a host of products.

Surface Active Agents

The time-saving HLB method of choosing emulsifiers, wetting agents, solubilizers, detergents—for insecticides, textiles and polishes. Special grades for cosmetics, pharmaceuticals, foods.

Plus other Atlas Products

Industrial finishes. Resinous asbestos laundry covers. Industrial explosives—milli-second delay blasting. Activated carbons—Darco products for purifying chemical process liquids.

ATLAS INDUSTRIAL CHEMICALS DEPARTMENT

CHEMICALS ATLAS EXPLOSIVES

ATLAS POWDER COMPANY, Wilmington, Del. • *Offices in principal cities* • *Cable Address—Atpowco*

In Canada address **A. F. Sterne and Sons** *Brantford, Ontario*
LIMITED

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Fletcher
HIGH SPEED CENTRIFUGALS
Reduce Unloading Time
Because . . . "Centroid" Speed Control permits faster bottom unloading of solids at a safe speed of 50 RPM . . . and Fletcher Centrifugals have largest capacity in proportion to basket diameter. For complete details, write for our Bulletin.
MOTOR DRIVEN SUSPENDED AND OPEN TOP
FLETCHER CENTRIFUGALS
FLETCHER WORKS, 235 GLENWOOD AVE., PHILADELPHIA 40, PA.

EXHIBITORS
Classified by Products

OVENS, ELECTRIC LABORATORY

Aloe Co., A. S. (720)
American Instrument Co., Inc. (385–387)
Denver Equipment Co. (507)
Electric Hotpack Co., Inc., The (655–656)
Fisher Scientific Co.—Eimer & Amend (57)
Gamma Scientific Co. (497)
General Electric Apparatus Dept. (4)
General Laboratory Supply Co. (711)
Machlett & Son, E. (381 & A)
New York Laboratory Supply Co., Inc. (218)
Palo-Myers, Inc. (642)
Precision Scientific Co. (701–702)
Rockwell Co., W. S. (447)
Rosevear Co., M. B. (602)
Scientific Glass Apparatus Co., Inc. (215–219)
Standard Scientific Supply Corp. (618)
Thomas Co., Arthur H. (665–666)
Trent, Incorporated (526–527)
Welch Manufacturing Co., W. M. (405–406)
Wiegand Co., Edwin L. (601)
Will Corp. (225–227)

OVENS, INDUSTRIAL

American Instrument Co., Inc. (385–387)
Electric Hotpack Co., Inc., The (655–656)
Falstrom Co. (510–511)
General Electric Apparatus Dept. (4)
Rockwell Co., W. S. (447)
Rosevear Co., M. B. (602)
Selas Corp. of America (533–534)
Trent, Incorporated (526–527)
Wiegand Co., Edwin L. (601)

PACKING

Duriron Co., Inc., The (19–20)
Garlock Packing Co., The (244)
Jeffrey Manufacturing Co., The (44A–45) Barrell
Johns-Manville (93–94)
National Carbon Co., Inc. (30–31)
Richardson Scale Co. (659–660)
York Co., Inc., Otto H. (380) Tower

PACKAGING EQUIPMENT & SUPPLIES

Aluminum Co. Of America (70–71)
Austenal Laboratories, Inc. (573A)
Bemis Bros. Bag Co. (338–340)
Colton Co., Arthur (719)
Continental Can Co., Inc.—Fibre Drum Section (243–245)
Economic Machinery Co. (545–546)
Fitzpatrick Co., The W. J. (401–402)
Fulton Bag & Cotton Mills (424)
Glengarry Processes, Inc. (564)
Gump Co., B. F. (362–364)
M R M Co., Inc. (638)
New Jersey Machine Corp. (485–486)
Rodgers Co., George G. (612)
St. Regis Sales Corp. (530–532)
Stokes Machine Co., F. J. (80)
Wiegand Co., Edwin L. (601)

PAPER MACHINERY

Bird Machine Co. (535–536 & 543–544)
Cowles Co., Inc., The (572–575)
Day Co., The J. H. (718)
Great Western Manufacturing Co. (372–374)
Lawrence Machine & Pump Corp. (663)
Lukens Steel Co. & Divisions—By-Products Steel Co. & Lukenweld (558–563)

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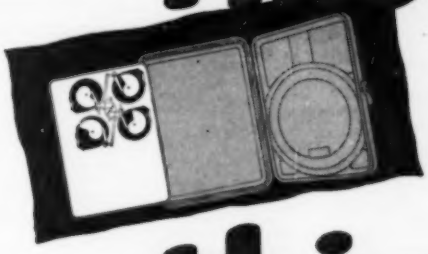
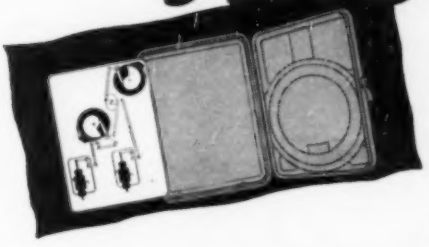
you can have this



...or this



More than 100,000 different instrument combinations are now possible from four basic circuits and eight basic component parts. That's how Bailey has simplified electronic controls for processing industries.

No matter what your process may be, you can use Bailey controls for flow, temperature, pressure, level, speed, gas analysis, pH, conductivity, etc. Four circuits and eight basic parts are all you need. You don't have to carry a large stock of replacement parts. Bailey parts are interchangeable. The units you use for one control can quickly be adapted to another.

To learn how Bailey controls can save you money and speed up control installations, write for a copy of Bailey Bulletin No. 17.

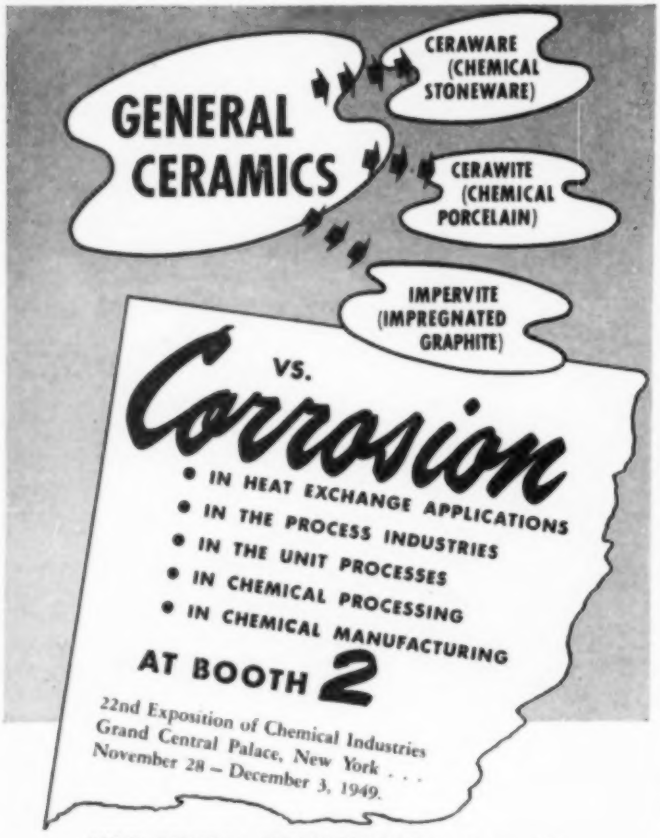
or 100,000 other instrument combinations
. . . with 4 circuits . . . 8 basic parts . . .

P-16

BAILEY METER COMPANY
1054 Ivanhoe Rd. • Cleveland 10, Ohio
BAILEY METER CO. LIMITED, MONTREAL
Controls for the Chemical Industry
TEMPERATURE • FLOW • PRESSURE
GAS ANALYSIS • LEVEL • RATIO

4 + 8 Works Here . . .
Sayreville, N. J., Plant of National Lead Company, Titanium Division, where Bailey Instruments are helping to process titanium dioxide pigments.

Guide & Directory Page 53



VISIT GENERAL CERAMICS' BOOTH 2 AT THE CHEMICAL SHOW TO:

GET the right answers to *any* corrosion problem.

SEE examples of General Ceramics' *complete* engineering service.

HELP your purchasing and engineering departments eliminate needless responsibility and detail by taking advantage of General Ceramics' SSS*. . . *Single Source of Supply.*

If you can't visit our booth, write for complete information on General Ceramics' facilities.

YOU SAVE 3 WAYS WITH GENERAL CERAMICS' SSS*

Savings through uniformity of construction . . . no misfits.
Savings on shipping costs . . . one shipment for everything.
Savings on paper work, accounting . . . one order, one bill.

General Ceramics AND STEATITE CORP.
CHEMICAL EQUIPMENT DIVISION
15 Crows Mill Road Keasbey, New Jersey

[*Sales Offices in:* BUFFALO, CHICAGO, LOS ANGELES, PITTSBURGH, PORTLAND, ORE., SAN FRANCISCO, SEATTLE, TACOMA, MONTREAL, TORONTO, VANCOUVER, B. C.]

Our Insulator Division Manufactures Steatites, Porcelains, Titanates, Ferrites

*Single Source of Supply. Printed in U.S.A. 7317

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EXHIBITORS
Classified by Products

New Jersey Machine Corp. (485–486)
Patterson Foundry & Machine Co., The (707–708)
Rietz Manufacturing Co. (648)
Rodgers Co., George G. (612)

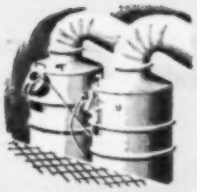
PERFORATED METALS
Ampco Metals, Inc. (268)
Great Western Manufacturing Co. (372–374)
Industrial Steels, Inc. (649–650)
Rockwell Co., W. S. (447)

PETROLEUM PRODUCTS
Bowser, Inc. (461A)
Oronite Chemical Co. (705)
Patterson Foundry & Machine Co., The (707–708) Pebble, Ball, Tube, Rod
Socony-Vacuum Oil Co., Inc. (324–326) Oils, Lubricants, Greases

pH EQUIPMENT
American Instrument Co., Inc. (385–387)
Aloe Co., A. S. (720)
Bailey Meter Co. (56)
Cambridge Instrument Co., Inc. (330–332)
Denver Equipment Co. (507)
Fisher Scientific Co.—Eimer & Amend (57)
General Laboratory Supply Co. (711)
Macbeth Corp. (201)
Machlett & Son, E. (381 & A)
Minneapolis-Honeywell Regulator Co.—Brown Instrument Div. (40–41) Recording Instruments & Recording Controlling Instruments in Pneumatic & Electric Control Styles
National Technical Laboratories (265–269)
New York Laboratory Supply Co., Inc. (218)
Palo-Myers, Inc. (642)
Permutit Co., The (403–404)
Photovolt Corp. (270–272)
Roy Co., Milton (432–433)
Scientific Glass Apparatus Co., Inc. (215–219)
Standard Scientific Supply Corp. (618)
Thomas Co., Arthur H. (665–666)
Wallace & Tiernan Co., Inc. (519–521)
Welch Manufacturing Co., W. M. (405–406)
Will Corp. (225–227)

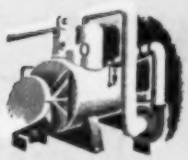
PHARMACEUTICAL MACHINERY
Alsop Engineering Corp. (293)
Aluminum Co. of America (70–71)
Bowen Engineering, Inc. (400–400A)
Chase Equipment Co. (547)
Chemicolloid Laboratories, Inc. (257)
Colton Co., Arthur (719)
Day Co., The J. H. (718)
Eppenbach, Inc. (278)
Fitzpatrick Co., The W. J. (401–402)
Great Western Manufacturing Co. (372–374)
Hercules Filter Corp. (443–445)
Koven & Brother, Inc., L. O. (304–306)
M R M Co., Inc. (638)
Patterson Foundry & Machine Co., The (707–708)
Perl-Oussani Machine Manufacturing Co. (644–645)
Pfaudler Co., The (72–73)
Popper & Klein, Inc. (209–211 & 370)
Read Machinery Div. of The Standard Stoker Co., Inc. (280)
Republic Seitz Filter Corp. (557)
Roy Co., Milton (432–433)
Selas Corp. of America (533–534) Filters
Stokes Machine Co., F. J. (80)
Tri-Homo Corp. (626)

Valuable food proteins are recovered by this Multiple Effect Evaporator.



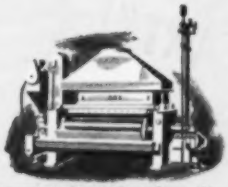
Low Temperature Evaporator, concentrates citrus and other fruit juices.

Double Effect Milk Evaporator, concentrates 40,000 lbs. of milk per hour.



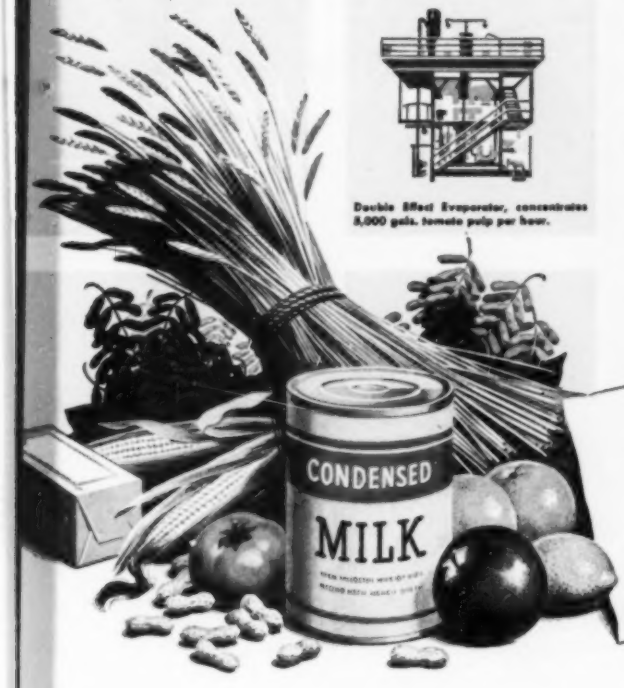
Vapor Desolventizing system revolutionizes solvent removal from soybean flakes.

Double Effect Evaporator, concentrates 5,000 gals. tomato pulp per hour.



Atmospheric Double Drum Dryer, dries milk and other food products.

Engineering, procurement and construction of complete plants for the food, chemical and all specialized industries.



BACKGROUND FOR *Better* FOODS

BLAW-KNOX has for many years been a leading designer and fabricator of equipment for the food, chemical and process industries.

Among the facilities of established value to Blaw-Knox customers is a Research and Testing Plant, consisting of modern semi-plant units of the latest and most advanced design. Here practical research is applied to problems involving drying, evaporation, extraction, impregnation, solvent recovery, crystallization and food processing. Results are definite in determining commercial possibilities by supplying accurate forecasts of full production results.

To the food, chemical and all specialized manufacturing and processing industries, Blaw-Knox offers expert comprehensive services, including engineering, procurement and erection of complete plants—turnkey jobs. In the case of those who already may have plant facilities, Blaw-Knox can help by supplying equipment to make the plant more profitable.

• • •

The eleven divisions of Blaw-Knox, operating 8 fully equipped, modern plants, make Blaw-Knox thinking and engineered products available in many fields. These services and products include:

Steel Plant Equipment . . . Rolls for Steel and Non-Ferrous Mills . . . Rolling Mill Machinery . . . Construction Equipment . . . Radio and Transmission Towers . . . Power Piping . . . Steel Grating . . . Steel and Alloy Castings . . . Clamshell Buckets . . . Sprinkler Systems . . . Engineering, Procurement, Fabrication and Construction of Complete Plants and Equipment for the Food, Chemical and all Specialized Manufacturing and Process Industries.

BLAW-KNOX *Company*

A PACEMAKER FOR AMERICAN INITIATIVE AND INGENUITY

2890 Farmers Bank Building
Pittsburgh 22, Pa.

OPERATING AND SALES DIVISIONS—
BLAW-KNOX DIVISION • BLAW-KNOX SPRINKLER DIVISION* • BUFLOVAK EQUIPMENT DIVISION • BUFLOVAK MIDWEST COMPANY • CHEMICAL PLANTS DIVISION • THE FOOTE COMPANY, INC.** • LEWIS FOUNDRY & MACHINE DIVISION • NATIONAL ALLOY STEEL DIVISION • PITTSBURGH ROLLS DIVISION • POWER PIPING DIVISION* • UNION STEEL CASTINGS DIVISION.

*Operates as a division of Blaw-Knox Construction Co.
**Subsidiary of Blaw-Knox Co.

"STAINLESS ARMOR PROTECTS THE HEART"

The Only Safety Valve of its Kind in the World

FarriSeal is the valve that's winning new friends in the Petrochemical industries, because FARRISEAL is the only Safety-Relief Valve protected from corrosion by stainless steel armor.* That's why the FARRISEAL is safe—sure to open at the set pressure, even under corrosive conditions which make ordinary valves dangerous.

The FARRISEAL Bellows effectively isolates and fully protects the heart of this popular valve from the action of acids, caustics and other corrosive materials. It makes possible substantial savings in operating, maintenance and replacement costs.

Minimizing back pressure surge effects makes possible tremendous savings through the use of smaller down-stream piping and collecting systems.

Proof of dependability of the FARRISEAL Bellows-Protected Valve is amply provided by hundreds of successful installations, including some of the largest and most important refineries and chemical plants.

Detailed data available on request—without obligation.

FARRIS ENGINEERING CORP., 412 COMMERCIAL AVE., PALISADES PARK, N. J.

*Also available in rubber or Neoprene for special applications.

Farris

5914

SAFETY and RELIEF VALVES

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EXHIBITORS Classified by Products

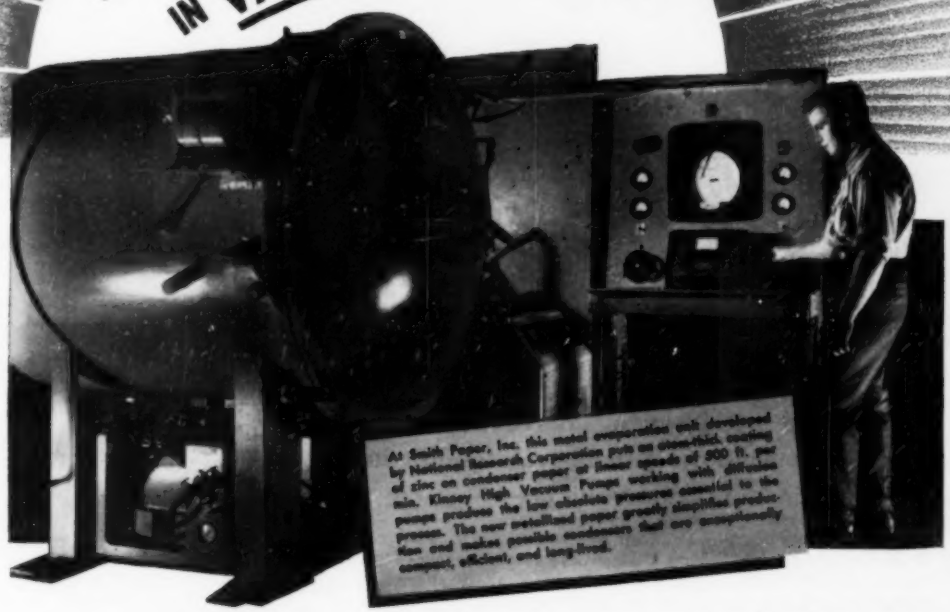
PIGMENTS

Aluminum Co. of America (70–71)
Dicalite Div., Great Lakes Carbon Corp. (86) Extender Pigments in Paint, Pigments in Paper Coatings
Magna Manufacturing Co., Inc. (609)
National Lead Co. (247)
Titanium Alloy Manufacturing Div.—National Lead Co. (366–368)

PIPE AND FITTINGS (KIND)

Allegheny Ludlum Steel Corp. (250–254) Stainless Steel
Aluminum Co. of America (70–71)
American Hard Rubber Co. (303–305) Hard Rubber—Rubber Lined & Plastics
Ampco Metal, Inc. (268) Acid-Corrosion Resisting, Welding
Barco Manufacturing Co. (515) Joints (Flexible)
Blickman Inc., S. (474–475) Fabricated Stainless & Alloy
Carpenter Steel Co., The—Alloy Tube Div. (500–501) Stainless Steel
Cooper Alloy Foundry Co., The (565–566) Stainless Steel, Nickel, Monel
Corning Glass Works (391–395) Glass
Crane Co. (297) Steel, Brass & Alloy
Duriron Co., Inc., The (19–20) Acid Resisting
Fisher & Porter Co. (203–207) Glass
General Ceramics & Steatite Corp. (2) Stoneware
Glascote Products, Inc. (657–658) Glass Lined
Grinnell Co., Inc. (251)
Hasco Valve & Machine Co. (569) Stainless
Haveg Corp. (51)
Haynes Stellite Co. (92) Corrosion, Heat Resistant
Heil Process Equipment Corp. (539) Lead Lined, Rubber Lined
International Nickel Co., Inc., The (9–10) Monel, Nickel, Seamless Pipe, Cast Fittings of same Alloys
Johns-Manville (93–94) Asbestos—Cement
Knapp Mills, Inc.—Andrews-Knapp Construction Co., Inc. (23) Lead Lined
Knight, Maurice A. (53)
Koven & Brother Inc., L. O. (304–306) Welded Steel Piping 18" & up in Diameter, any Length. For Chemical, Water, Oil or Processing Systems
Lapp Insulator Co., Inc. (441–442) Porcelain
Lead Lined Iron Pipe Co. (23) Lead Lined
Luzerne Rubber Co., The (528–529) Hard Rubber
Metal Glass Products Co., Inc. (425–426) Stainless Steel
National Carbon Co., Inc. (30–31) Impervious Carbon & Graphite
National Lead Co. (247) Lead
Pfaudler Co., The (72–73)
Rockwell Co., W. S. (447) Fabricated Pipe
Saran Lined Pipe Co. (621) Corrosion Resistant
Schutte & Koerting Co. (291)
Taylor Forge & Pipe Works (727–728) Welding
Tri Clover Machine Co. (498) IPS & Tube Size—Corrosion Resistant
U. S. Stoneware Co., The (89–91) Stoneware and Porcelain
Walworth Co. (316–318) Steel, Iron Bronze, Stainless Steel & Special Alloys—Threaded, Flanges, Welding End & Silver Brazed

THERE'S A BRIGHT NEW WORLD IN VACUUM PROCESSING



At Smith Paper, Inc. this metal evaporation unit developed by National Research Corporation puts an atom-thick coating of zinc on condenser paper at linear speeds of 500 ft. per min. Kinney High Vacuum Pumps working with diffusion pumps produce the low absolute pressures essential to the process. The new metallized paper greatly simplifies production and makes possible condensers that are exceptionally compact, efficient, and long-lived.

SIZE AND CAPACITY FOR EVERY NEED: 8 single stage models and 2 compound models. Capacities from 13 to 702 cu. ft. per min. — low absolute pressures to 0.5 micron.

Every day new products and processes are developing in the low absolute pressures produced by Kinney High Vacuum Pumps. Metal evaporation, for example, doubles the reflective power of mirrors . . . produces electrical condensers that are smaller, yet more powerful . . . makes possible costume jewelry and ornaments of new brilliance. Low pressure processing with Kinney Pumps is also performing near-miracles in the production of light bulbs, radio and television tubes, pharmaceuticals, sintered metals, titanium, and many other products.

Kinney High Vacuum Pumps with their unique oil-sealed pumping mechanism are noted for high volumetric efficiency and fast pump down. They are ruggedly built to give dependable service day after day, and to conserve valuable processing time. Whether you need vacuums to 10 microns or a fraction of a micron, Kinney Pumps will do the job reliably and at low cost. Write for engineering information and Bulletin V-45, the full story on Kinney High Vacuum Pumps.

KINNEY MANUFACTURING COMPANY
3551 WASHINGTON ST., BOSTON 30, MASS.
NEW YORK • CHICAGO • CLEVELAND • PHILADELPHIA • LOS ANGELES • SAN FRANCISCO
HOUSTON • NEW ORLEANS • SEATTLE
FOREIGN REPRESENTATIVES
General Engineering Co. (Radcliffe) Ltd., Station Works, Bury Road, Radcliffe, Lancashire, England
Horrocks, Roxburgh Pty., Ltd., Melbourne, C. I. Australia
W. S. Thomas & Taylor Pty., Ltd., Johannesburg, Union of South Africa
Novelectric, Ltd., Zurich, Switzerland
WE ALSO MANUFACTURE LIQUID PUMPS, CLUTCHES AND BITUMINOUS DISTRIBUTORS

Making old things BETTER
Making new things POSSIBLE

KINNEY HIGH VACUUM PUMPS

Guide & Directory Page 57

How Hamilton Rubber Co. Saves $100 a month with Pangborn Dust Control, even though dust collected has no resale value!

DUST salvaged by the Hamilton Rubber Co. *has no resale value* . . . yet this Pangborn CH Dust Collector saves them *$100 or more* a month! Careful records kept by the company show *direct savings* in building and equipment maintenance, in plant housekeeping and in improved working conditions. Compared with savings, *operating costs are negligible* . . . proof that it's more profitable to control dust than to ignore it.

PANGBORN DUST CONTROL CAN SAVE YOU MONEY

No matter if the dust in your plant is *valuable, hazardous,* or *just a nuisance* . . . chances are Pangborn Dust Control will *save you money.* Find out . . . there's no obligation. Pangborn Engineers will check your plant, then give you their unbiased opinion. *You make the decision.* For full information, write today for Bulletin 909A to PANGBORN CORPORATION, 283 Pangborn Blvd., Hagerstown, Md.

Look to Pangborn for the Latest Developments in Dust Control and Blast Cleaning Equipment.

STOP THE DUST HOG
from stealing profits with
Pangborn
DUST CONTROL
Guide & Directory Page 58

EXHIBITORS Classified by Products CONTINUED

U. S. Steel Corp. (76–77)

PLASTICS
American Hard Rubber Co. (303–305)
Saran and Parian (Polyethylene)
General American Transportation Corp. (285–287)
General Ceramics & Steatite Corp. (2)
General Electric Apparatus Dept. (4)
Haveg Corp. (51)
Hercules Filter Corp. (443–445)
Hercules Powder Co. (7W)
Koppers Co., Inc.—Chemical Div. (264)
Reichhold Chemicals, Inc. (651–654)
St. Regis Sales Corp. (530–532)
U. S. Stoneware Co., The (89–91)

PLASTICIZERS
American Resinous Chemicals Corp. (35–36)
Atlas Powder Co. (46–47)
Carbide & Carbon Chemicals Corp. (17–18 & 92)
Emery Industries, Inc. (283)
General Aniline & Film Corp. (619–620)
Hercules Powder Co. (7W)
Koven & Brother, Inc., L. O. (304–306)
National Lead Co. (247)
Pfizer & Co., Inc., Chas. (5)
Victor Chemical Works (729–734)

PLATINUM—WIRE, SHEET, FOIL, CRUCIBLES, LABORATORY WARE
Aloe Co., A. S. (720)
American Platinum Works, Inc. (457)
Fisher Scientific Co.—Eimer & Amend (57) Laboratory Ware
Machlett & Son, E. (381 & A)
Welch Manufacturing Co., W. M. (405–406)
Will Corp. (225–227) Laboratory Ware

PORCELAIN WARE
Aloe Co., A. S. (720)
General Ceramics & Steatite Corp. (2)
General Laboratory Supply Co. (711)
Illinois Electric Porcelain Co. (672–673)
Lapp Insulator Co., Inc. (441–442)
Machlett & Son, E. (381–& A)
New York Laboratory Supply Co., Inc. (218)
Patterson Foundry & Machine Co., The (707–708)
Selas Corp. of America (533–534) Filters Special
Thomas Co., Arthur H. (665–666)
U. S. Stoneware Co., The (89–91)
Will Corp. (225–227)

PRESSES HYDRAULIC
American Instrument Co., Inc. (385–387)
Carver Inc., Fred S. (237)
Machlett & Son, E. (381–& A)
Stokes Machine Co., F. J. (80)

PRESSURE RELIEF AND RUPTURE RELIEF DEVICES
Black, Sivalls & Bryson, Inc. (496)
Crane Co. (297)
Energy Control Co., Inc. (722)

PUBLISHERS
American Chemical Society News Service (26–27)
Analytical Chemistry (26–27)
Chemical Industries—McLean Hunter Pub. Corp.

full line from a single source

BEMIS paper bags for chemicals

As one of America's largest producers of multiwalls and other paper bags, Bemis naturally makes many types to serve varied packaging requirements.

For the chemical industry, several types of construction are produced. The paper bags most generally used are shown here.

Note the variety of the Bemis line when you are buying paper bags for chemicals. It gives you wider choice in quality bags from a single source.

Bemis

Peoria, Ill. • East Pepperell, Mass. • Mobile, Ala. • Houston, Texas
San Francisco, Calif. • Vancouver, Wash. • Wilmington, Calif.

Baltimore • Boise • Boston • Brooklyn • Buffalo • Charlotte • Chicago • Cleveland • Denver
Detroit • Indianapolis • Jacksonville, Fla. • Kansas City • Los Angeles • Louisville • Memphis
Minneapolis • New Orleans • New York City • Norfolk • Oklahoma City • Omaha • Phoenix
Pittsburgh • St. Louis • Salina • Salt Lake City • Seattle • Wichita

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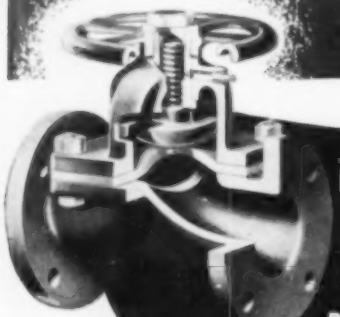
Now you can valve 66° Bé Sulphuric Acid without leakage, dripping or sticking



HILLS-McCANNA *Diaphragm Valves* with L-1 PLASTIC DIAPHRAGMS

NEWLY developed plastic diaphragms for Hills-McCanna Diaphragm Valves now make it possible to handle 66° Bé sulphuric acid without leaking, dripping or sticking. The combination of the proved Saunders Patent pinch clamp principle with the new plastic diaphragm puts an end to these troubles so common in valving 66° Bé sulphuric.

Hills-McCanna Diaphragm Valves for handling 66° Bé sulphuric are suitable for temperatures up to 125° F., pressures up to 100 psi. To get complete information, price and delivery data, write today. Specify valve sizes (½" to 4" incl.) and body material (cast iron, cast steel, Durimet or glass lined) desired. Full explanation of the Saunders Patent principle and specifications for Hills-McCanna valves for other services are given in Catalog V-48, available on request. HILLS-McCANNA COMPANY, 2341 W. Nelson Street, Chicago 18, Illinois.

HILLS-McCANNA
diaphragm valves
saunders patent
Proportioning Pumps
Force-Feed Lubricators · Magnesium Alloy Castings
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EXHIBITORS Classified by Products CONTINUED

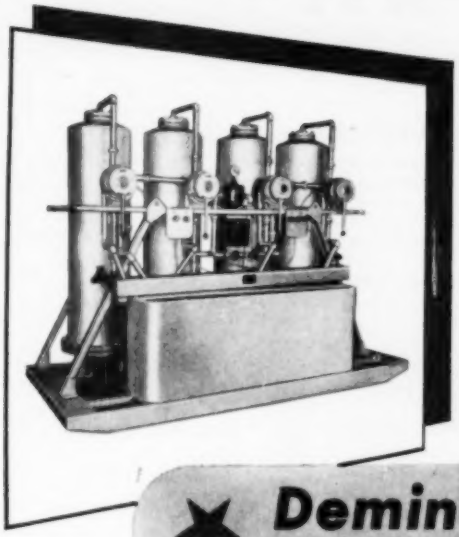
Chemical Abstracts (26–27)
Chemical Engineering (42)
Chemical Engineering Catalogue (26–27)
Chemical Engineering News (26–27)
Chemical Materials Catalogue (26–27)
Chemical Processing Preview (506)
Chemical Engineering Progress (572A)
Food Industries (42)
Food Processing Preview
Industrial & Engineering Chemistry (26–27)
Interscience Publishers, Inc. (467)
McGraw-Hill Book Co. (610)
McGraw-Hill Publishing Co. (42)
Metal Industries Catalogue (26–27)
Progressive Architecture (26–27)
Putnam Publishing Co. (506)
Reinhold Publishing Corp. (26–27)
Van Nostrand Co., Inc., D. (85)

PULVERIZERS

Allis-Chalmers Manufacturing Co. (48–49)
American Instrument Co., Inc. (385–386)
Combustion Engineering—Superheater, Inc.—Raymond Pulverizer Div. (67) Screen Mills, Automatic Pulverizers, Vertical Mills, Laboratory Mills
Denver Equipment Co. (507)
Fitzpatrick Co., The W. J. (401–402)
Jeffrey Manufacturing Co., The (44A–45)
Macllett & Son, E. (381–& A)
Patterson Foundry & Machine Co., The (707–708)
Precision Scientific Co. (701–702)
Pulverizing Machinery Co. (300–302)
Rietz Manufacturing Co. (648)
Sprout, Waldron & Co., Inc. (550–553)
Sturtevant Mill Co. (3)
Swenson Evaporator Co.—Div. of Whiting Corp. (43)
Will Corp. (225–227) Laboratory
Williams Patent Crusher & Pulverizer Co. (295)
Alsop Engineering Corp. (293) Centrifugal-Positive Pressure
American Hard Rubber Co. (303–305) Hard Rubber & Rubber Llined Rotary, Centrifugal & Reciprocating
Ampco Metal, Inc. (268) Centrifugal-Corrosion Resisting
Chemicolloid Laboratories, Inc. (257) Positive Sanitary
Croll-Reynolds Co. (505) Vacuum
Denver Equipment Co. (507) Vertical & Diaphragm
Dorr Co., Inc., The (64) Variable Strokes, Sludge & Slurry
Duriron Co., Inc., The (19–20) Centrifugal & Self Priming
Eastern Industries, Inc. (Centrifugal Rotary, Vane (220–222–224) Chemical, Positive Pressure
Eco Engineering Co. (641) Gearless-Stainless Steel, Bronze, Naval, Circulating, Pressure, Chemical, Carbonator
Ertel Engineering Corp. (508–509)
Fisher Scientific Co.—Eimer & Amend (57) Laboratory
Fuller Co. (315–317) Vacuum
General Ceramics & Steatite Corp. (2) Centrifugal & Stoneware
Goulds Pumps, Inc. (625) Stainless Steel, Centrifugal for all Services
Greiner Co., The Emil (226–228) Rotary, Laboratory
Bartlett & Snow Co., The C. O. (427–428)
Combustion Engrg., Superheater, Inc. (266)

Distilled Water

WHERE COMPLETE PURITY IS NEEDED



Demineralized Water

FOR MODERN MANUFACTURING PROCESSES

...both made with Barnstead Equipment

If your requirements for either distilled or demineralized water are from ½ to 1000 gallons per hour, you can best satisfy them with one of the 200 models and sizes in the complete Barnstead line. Whether it's demineralized water or distilled water, Barnstead's aim is to help produce *purer* water at *lower* cost with *greater* ease. Ask the Barnstead Engineer for the RIGHT answer to any pure water problem.

WRITE TODAY: For a Barnstead Pure Water Questionnaire, which lists the information we need to determine what Barnstead equipment you should have. There is no cost or obligation for this service.

Write for Literature

For Barnstead, with over 70 years of experience in solving pure water problems, can help you lower costs, increase manufacturing and processing efficiency, and provide you with the exact water still or demineralizer, or both, to suit your particular requirements.

Meet BARNSTEAD
At The Chem. Show.
See the NEW BARNSTEAD Insulated Laboratory Autoclave on Display
GRAND CENTRAL PALACE, NEW YORK
From November 28 to December 3
BOOTHS 229 and 231

Barnstead
STILL & STERILIZER CO.
4 Lanesville Ter., Forest Hills, Boston 31, Mass.

FIRST IN PURE WATER
FOR BETTER PRODUCTS AND PROCESSES

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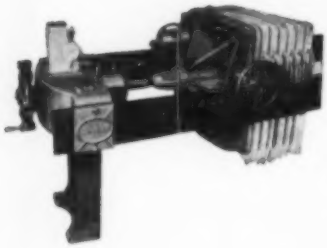
What's New with

SHRIVER

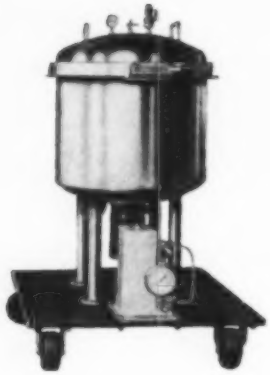
Developments for Your Processes?



THE HYDRO-KLOSER

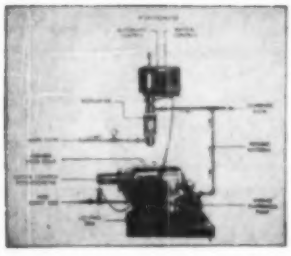
A simple, low cost, easy-to-install, easy-to-operate, Shriver hydraulic closing device for old or new 24" and larger plate and frame filter presses. Quickly pays for itself in time and labor saving; easier, tighter closing and greater safety to workmen and process. Makes closing and opening of the filter press practically automatic.

●



HORIZONTAL PLATE PRESSURE FILTER

Cartridge of filter plates enclosed in tank eliminates leakage and evaporation; filters from center of plates; no unfiltered slurry in tank which is not under pressure; tank easy to clean. Horizontal position of plates permits building up cakes of uniform density and thickness. Cartridge may be removed from tank for cleaning. Fast flow rate — up to 60 gallons per square foot filtering area per hour. Uses any filter medium or aids. Permits washing, extraction, drying.



PROPORTIONAL FEEDER

For proportionally supplying thick, viscous, corrosive or abrasive materials to a system in which the main flow of material may vary widely; capacities from 1 to 90 G.P.M. Provides controlled proportional or constant feed rates. Incorporates Shriver Diaphragm Feed Pump of any desired material of construction with a variable speed drive, activated through a rotameter, potentiometer and electronic circuit to increase or decrease slurry volume fed to vary with rate of flow of main material.

These and other developments from the Shriver laboratory and engineering department may help you vitally in improving your processes. Write us for information. If you have a special problem, tell us about it.

Visit Booth 12 at the Chemical Show

T. SHRIVER & COMPANY, Inc.

802 HAMILTON ST. HARRISON, N. J.

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EXHIBITORS Classified by Products CONTINUED

Hasco Valve & Machine Co. (569) Molten Sulphur
Haveg Corp., (51)
Hills-McCanna Co. (346) Metering & Proportioning
Industrial Steels, Inc. (649–650)
Ingersoll-Rand Co. (615–617) Centrifugal
Jabsco Pump Co. (430) Stainless Steel, "Rubber" Impeller, Rotary, Sanitary, Abrasive Resisting Slurry
Kinney Manufacturing Co. (468–469) Vacuum, Liquid
LaBour Co., Inc., (32) Acid, Centrifugal, Packingless, Self Priming
Lapp Insulator Co., Inc. (441–442) Porcelain Centrifugal & Proportioning
Lawrence Machine & Pump Corp. (663) Centrifugal
Luzerne Rubber Co., The (528–529) Hard Rubber
Machlett & Son, E. (381 & A)
Manton Gaulin Manufacturing Co., Inc. (476) High Pressure
Metal Glass Products Co., Inc. (425–426) Stainless Steel
National Carbon Co., Inc. (30–31) Impervious Graphite
Oliver United Filters, Inc. (66) Diaphragm Slurry Pumps Acid-Handling Pumps
Pfaudler Co., The (72–73)
Precision Scientific Co. (701–702) Laboratory
Process & Instrument (518) Custom Built

PUMPS (KINDS)

Bowser Inc. (461A)
Nash Engrg. Co. (16)
%Proportioneers, Inc.% (477–478) Proportioning-Simplex, Duplex, Triplex & Quadruplex Chemical Proportioning Acid Proportioning
Republic Seitz Filter Corp. (557)
Robbins & Myers, Inc. (639–640)
Rodgers Co., George G. (612) Centrifugal, Rotary, Turbine Roy Co., Milton (432–433) Chemical
Schutte & Koerting Co., (291) Gear & Jet
Shriver & Co., Inc., T. (12) Diaphragm
Stokes Machine Co., F. J. (80) Vacuum
Syntron Co. (311–313) Screw
Tri-Clover Machine Co. (298) Centrifugal
Waterous Co. (449) Positive, Rotary, Stainless Steel, Sanitary, Variable Capacity
Welch Manufacturing Co., W. M. (405–406) Vacuum
Will Corp. (225–227) Laboratory
Worthington Pump & Machinery Corp. (319–321) Centrifugal

PYROMETERS

American Instrument Co., Inc. (385–387)
Bailey Meter Co. (56)
Cambridge Instrument Co., Inc. (330–332)
Electric Hotpack Co., Inc., (655–656)
Engelhard, Inc., Charles (456)
General Laboratory Supply Co. (711)
Illinois Testing Laboratories, Inc. (38–39)
Machlett & Son, E. (381 & A)
Minneapolis-Honeywell Regular Co.—*Brown Instrument Div. (40–41) Indicators, Recorders & Controllers in both Millivoltmeter & Potentiometer Models

LET THESE Consolidated Instruments HELP YOU IN YOUR PROBLEMS OF MEASUREMENT AND CONTROL!

TITRILOG

The new Consolidated Titrilog, Model 26-102, continuously records the concentration of sulfur compounds such as SO_2, H_2S, mercaptans, thioethers, and disulfides in monitoring or control problems.

This highly sensitive and stable instrument will respond to a change in concentration as low as one part in ten million in approximately 20 seconds.

Provisions are included for selective measurement of compounds of specific interest. The entire unit is housed in a single cabinet and it operates on standard 60-cycle, 115-volt power.

For further information, write for Bulletin CEC-1810-X1.

Isotope-Ratio MASS SPECTROMETER

Through its ability to sort atoms and molecules according to weight, the Consolidated-Nier Isotope-Ratio Mass Spectrometer is the ideal instrument for the precise and rapid assay of *stable* isotopes.

Designed specifically for this one job, the Isotope-Ratio Mass Spectrometer's exceptional accuracy, combined with simplicity of operation, makes it a practical tool for scientific and industrial research in the important and expanding fields involving stable isotope techniques.

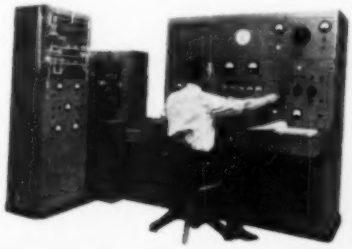
For further information, write for Bulletin CEC-1803-X12.

Analytical MASS SPECTROMETER

The Consolidated Analytical Mass Spectrometer is the accepted standard for analytical measurements and research in the major petroleum and chemical companies throughout the world.

Designed to satisfy the most critical research investigator, this Consolidated Mass Spectrometer is engineered and constructed in a manner to permit complex mixture analysis on a simple routine basis.

For further information, write for Bulletin CEC-1800-X6



LEAK DETECTOR

Operating on the mass spectrometer principle, the Consolidated Leak Detector offers a rapid, accurate, and economical means for the location of leaks in vacuum or pressure systems.

Using inert, noncontaminating helium gas as the testing material, this instrument combines extreme sensitivity with the utmost in reliability. Passage of helium through a leak is indicated by an audible alarm as well as a leak-rate meter.

Portability permits the Leak Detector to be used anywhere that 60-cycle, 115-volt power is available.

For further information, write for Bulletin CEC-1801-X12.

CONSOLIDATED ENGINEERING CORPORATION

Analytical Instruments for Science and Industry

620 NORTH LAKE AVENUE • PASADENA 4, CALIFORNIA

SEE US AT THE CHEM SHOW BOOTHS 703-4

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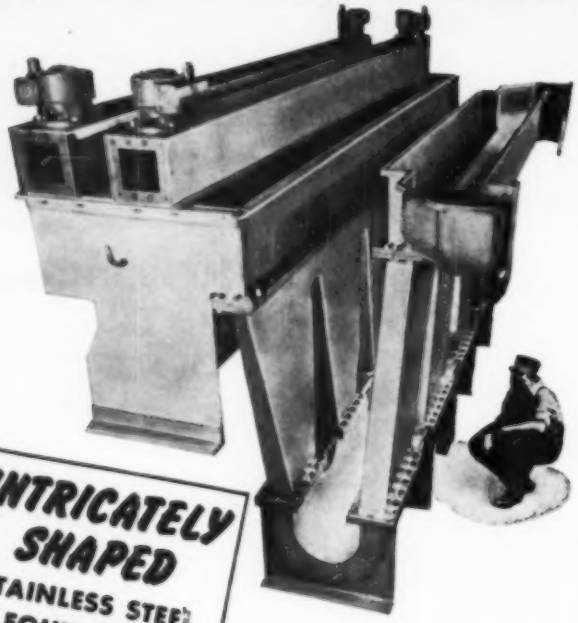


INTRICATELY SHAPED STAINLESS STEEL EQUIPMENT

When you require intricately shaped stainless steel equipment, bring your drawings to a fabricator who has had *special* experience in producing difficult shapes.

The fabricating of stainless steel requires skill even in the making of standard shapes. When odd shaped vessels are constructed, even greater skill is required. Your fabricator must have special tools and dies, tested manufacturing techniques and above all long experience with the behavior of stainless steel during fabrication to produce vessels that give maximum efficiency—longer life for your application.

S. Blickman, Inc. works *exclusively* with stainless steel and alloys—has been doing so for many years. Our engineering experience—our production techniques—our specially equipped plant—may help *you* solve the problems of getting better-built processing equipment in odd shapes. Consult with us.

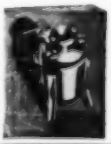
S. BLICKMAN, INC. • 611 GREGORY AVENUE, WEEHAWKEN, N.J.

SEE OUR EXHIBIT AT EXPOSITION CHEMICAL INDUSTRIES

S. BLICKMAN, INC.
Guards Alloys in Fabrication

SEND FOR THIS VALUABLE BOOK

A request on your letterhead will bring our guide, "What to Look For When You Specify Stainless Steel for Your Processing Equipment."



CORROSION RESISTANT PROCESSING EQUIPMENT

TANKS • KETTLES • STILLS • HEAT EXCHANGERS • AGITATORS • MIXERS • TOWERS • PIPING

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EXHIBITORS Classified by Products CONTINUED

Welch Manufacturing Co., W. M. (405–406)
Weston Electrical Instrument Corp. (263)
Will Corp. (225–227) Laboratory

RAW MATERIAL

Aluminum Co. of America (70–71)
Ampco Metal, Inc. (268)
Foote Mineral Co., Inc. (607-608) Lithium Chemicals, Strontium Chemicals, Manganese Chemicals, Tungsten Chemicals
Hercules Powder Co. (7W)
Magna Manufacturing Co., Inc. (609)
Titanium Alloy Manufacturing Div.—National Lead Co. (366–368)

RAYON EQUIPMENT

Aluminum Co. of America (70–71)
American Hard Rubber Co. (303–305)
Austenal Laboratories, Inc. (573A)
Baker Perkins, Inc. (62–63)
Chemicolloid Laboratories, Inc. (257)
Hercules Filter Corp. (443 to 445)
Knapp Mills, Inc.—Andrews-Knapp Construction Co., Inc. (23)
Lead Lined Iron Pipe Co. (23)
Luzerne Rubber Co., The (528–529)
Rietz Manufacturing Co. (648)
Sperry & Co., D. R.—*Henry E. Jacoby (540 to 542)
Swenson Evaporator Co.—Div. of Whiting Corp. (43)

RECORDING INSTRUMENTS

Bailey Meter Co. (56)
Builders-Providence, Inc. (493–495)
Cambridge Instrument Co., Inc. 330–332—pH Recorders
Consolidated Engineering Corp. (703–704)
Energy Control Co., Inc. (722)
Fischer & Porter Co. (203–207) Flow, Liquid Level, Spec. Gravity
General Electric Apparatus Dept. (4)
Hart-Moisture-Meters (680)
Industrial Instruments, Inc. (410)
Machlett & Son, E. (381 & A)
Minneapolis-Honeywell Regulator Co.—Brown Instrument Div. (40–41) Temperature, Pressure, Vacuum, Humidity, Flow, Liquid Level, & pH
Perkin-Elmer Corp., The (567–568)
Permutit Co., The (403–404)
Process & Instrument (518)
Rosevear Co., M. B. (602)
Stokes Machine Co., F. J. (80)
Toledo Scale Co. (448)
Uehling Instrument Co. (356) Vacuum, Absolute Pressure, Draft, Light Pressure Recorders
Wallace & Tiernan Co., Inc. (519–521)
Welch Manufacturing Co., W. M. (405–406)
Weston Electrical Instrument Corp. (263)
Bowser Inc. (461A)

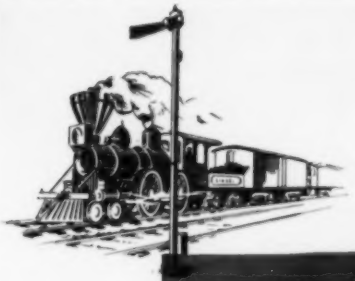
REFRACTORIES

Aluminum Co. of America (70–71)
Bowser, Inc. (461A)
Johns-Manville (93–94)
Knapp Mills, Inc.—Andrews-Knapp Construction Co., Inc. (23)
Lead Lined Iron Pipe Co. (23)
Machlett & Son, E. (381 & A)
Morton Co. (415–416)
Titanium Alloy Manufacturing Div. National Lead Co. (366–368)

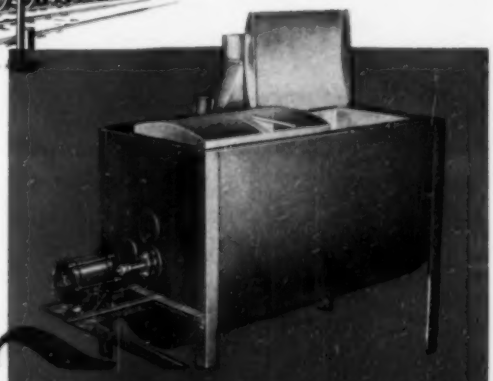
REFRIGERATING EQUIPMENT

Austenal Laboratories, Inc. (573A)
Croll-Reynolds Co. (506)

BACK IN THE 1880's



Jacketed mixing tank.
Stainless steel inside.
Steel outside.



WHEN THE FIRST POWER OPERATED SEMAPHORE WAS INVENTED

Koven

WAS MAKING INDIVIDUALIZED CHEMICAL EQUIPMENT

It is difficult to visualize today's vast railroad network without such equipment as power operated signal systems. It is equally hard to imagine the many modern chemical plants of today without their efficient, economical production methods. For over 68 years KOVEN has helped to achieve greater savings of time and money for such plants by designing and fabricating individualized chemical equipment built to meet the specific requirements of any particular job. Call or write KOVEN and one of our representatives will be glad to help solve your production problems—no obligation. Our complete facilities include: machine, welding, painting and galvanizing shops. X-ray inspection insures quality control. KOVEN equipment in all commercial metals and alloys includes: pressure vessels, extractors, mixers, stills, condensers, kettles, tanks, chutes, containers, stacks, coils.

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Plants: Jersey City, N. J.

Dover N. J.

Vacuum cooking kettle of stainless steel.

KOVEN FOR INDIVIDUALIZED CHEMICAL EQUIPMENT SINCE 1881

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PRECIOUS METALS SINCE 1875

231 NEW JERSEY R.R. AVE., NEWARK 5, N. J.

Guide & Directory Page 68

EXHIBITORS
Classified by Products

General Electric Apparatus Dept. (4)
Ingersoll-Rand Co. (615–617)
Luzerne Rubber Co., The (528–529)
Machlett & Son, E. (381 & A)
Magnetrol, Inc. (724)
Niagara Blower Co. (233–235)
Plate Coil Div. Kold-Hold Mfg. Co. (726)
Pressed Steel Tank Co. (348–352)

REGULATORS, PRESSURE AND TEMPERATURE

American Instrument Co., Inc. (385–387)
Austenal Laboratories, Inc. (573A)
Bailey Meter Co. (46)
Energy Control Co., Inc. (722)
Fenwal Incorporated (603)
Greiner Co., The Emil (226–228)
Hoke Incorporated (213) Pressure
Leslie Co. (676–677)
Machlett & Son, E. (381 & A)
Matheson Co., Inc., The (271)
Minneapolis-Honeywell Regulator Co.—Brown Instrument Div. (40–41) Non- Indicating, Indicating, Recording, Pneumatic & Electric
Process & Instrument (518)
Rosevear Co., M. B. (602)
Sarco Co., Inc. (11) Temperature
Stokes Machine Co. F. J. (80)
Weston Electrical Instrument Corp. (263)
Will Corp (225–227)

RESIN AND OIL

General Elictric Apparatus Dept. (4)
Haveg Corp. (51)
Hercules Powder Co. (7W) and Paint & Varnish Resins
National Lead Co. (247)
Reichhold Chemicals, Inc. (651–654)

RESPIRATORS

Great Western Manufacturing Co. (372–374)
Machlett & Son, E. (381 & A)
Martindale Electric Co. (440)
Mine Safety Appliance Co. (376–378)
Pangborn Corp. (75)
Willson Products, Inc. (419–420)

ROTAMETERS

Fischer & Porter Co. (203–207)
Greiner Co., The Emil (226–228)
Hoke Incorporated (213)
Jacoby-Tarbox Corp.—Henry E. Jacoby (540–542)
Schutte & Koerting Co. (291)
Selas Corp. of America (533–534) Gas

RUBBER PRODUCTS AND EQUIPMENT

American Hard Rubber Co. (303–305)
Chemicolloid Laboratories, Inc. (257)
Day Co., The J. H. (718) Equipment
Falstrom Co. (510–511)
Garlock Packing Co., The (244)
Hail Process Equipment Corp. (539)
Luzerne Rubber Co., The (528–529)
Pioneer Rubber Co., The (429)
Tri-Homo Corp. (626)
U. S. Stoneware Co., The (89–91)
Will Corp. (225–227) Stoppers & Tubing

RUST PROOFING

American Resinous Chemicals Corp. (35–36)
Lukens Steel Co. & Divisions—By-Products Steel Co. & Lukenweld (558–563)
Wallace & Tiernan Co., Inc. (519–521)

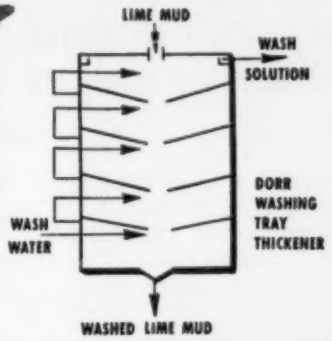
both

Continuous

Counter-

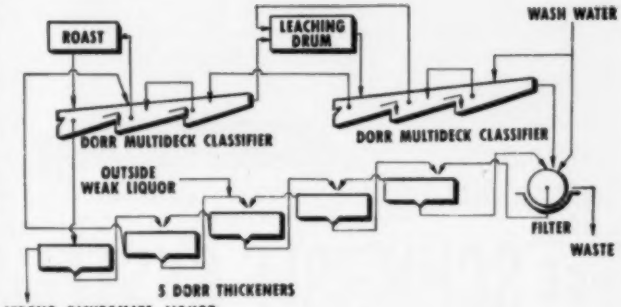
Current

Decantation



CCD at its simplest . . . one Dorr Washing Thickener, one Dorrco Pump. Used in the recausticizing step at chemical pulp mills to separate soda values from lime mud. Solids pass downward, compartment by compartment . . . values are transferred to a continuous upward flow of wash solution.

But what a difference!



Still CCD . . . but what a difference! This flowsheet uses two Dorr Multideck Classifiers, five Dorr Thickeners, five Dorrco Pumps, a leaching drum and filter. Chrome roast is continuously leached to yield a strong sodium dichromate liquor for evaporation. Insoluble waste product contains less than 1% of chromate values.

Large or small tonnages . . . simple or complex flowsheets . . . Dorr CCD Systems have been the standard of the Chemical Industry for over 30 years. If you have a problem involving washing, leaching, thickening, or any related liquid-solids operation, Dorr equipment plus Dorr technology can go to work for you on a dollar-saving basis.

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RESEARCH ENGINEERING EQUIPMENT

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See how Kewaunee saves *your* planning and engineering time, and relieves you of many headaches in laboratory design.

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See Kewaunee's new Low Velocity Fume Hood at New York Exposition of Chemical Industries Nov. 28—Dec. 3 Grand Central Palace Booths 308 and 310

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★ **SEE** our special display unit with transparent plastic shell showing how the Multi-wash Collector functions in controlling dust, inert material, soluble material, condensable vapors and absorbable fumes and vapors from chemical processes.

★ **SEE** photos of Schneible Multi-wash installations in operation in prominent chemical companies.

★ **SEE** flow-charts of the Schneible Multi-wash System and its application to a variety of processes.

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EXHIBITORS
Classified by Products

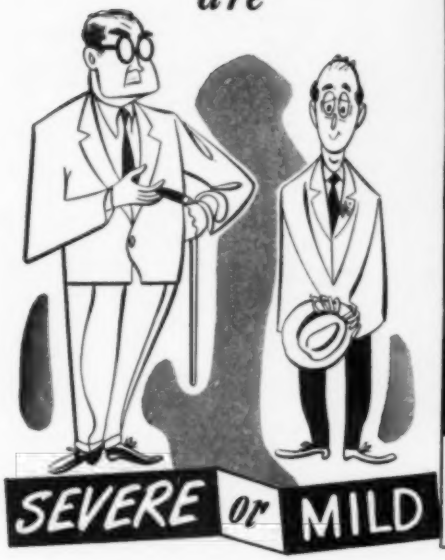
SAFETY EQUIPMENT
Ampco Metal, Inc. (268) Hand Tools
Falstrom Co. (510–511)
Fisher Scientific Co.—Eimer & Amend (57) Laboratory
Farris Engineering Corp. (662)
Martindale Electric Co. (440)
Mine Safety Appliance Co. (376–378)
Will Corp. (225–227)
Willson Products, Inc. (419–420)

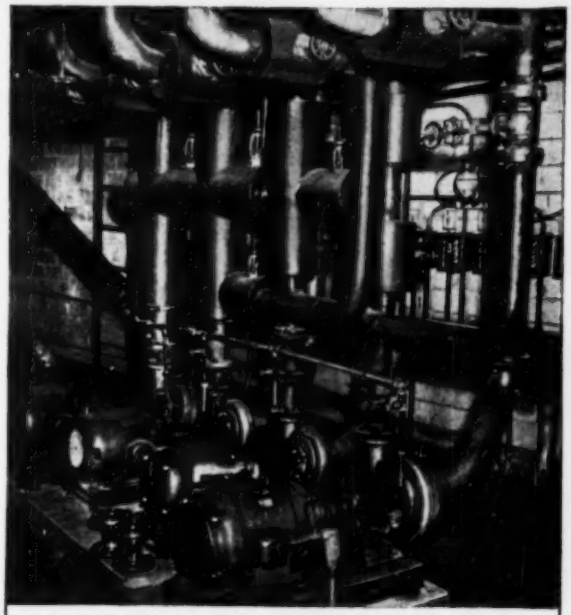
SCALES
American Instrument Co., Inc. (385–387)
Builders-Providence, Inc., (492–495) Continuous Weighing
Denver Equipment Co. (507)
Exact Weight Scale Co., The (472–473)
General Laboratory Supply Co. (711)
Glengarry Processes Inc. (564)
Gump Co., B. F. (362–364) Automatic-weigher's Automatic Net
Machlett & Son, E. (381 & A)
Pneumatic Scale Corp. Ltd. (22)
%Proportioneers, Inc.% (477–478) Loss in Weight Proportioning
Richardson Scale Co. (659–660)
Seederer-Kohlbusch Inc. (389)
Toledo Scale Co. (44B)
Welch Manufacturing Co., W. M. (405–406)
American Balance Co. (248)

SCREENS—INCLINED, VIBRATING, GYRATHORY
Allis-Chalmers Manufacturing Co. (48–49)
Day Co., The J. H. (718)
Denver Equipment Co. 507)
Great Western Manufacturing Co. (372–374)
Gump Co., B. F. (362–364)
Jeffrey Manufacturing Co., The (44A–45)
Link-Belt Co. (715–717)
Patterson Foundry & Machine Co., The (707–708)
Productive Equipment Corp. (549)
Roebling's Sons Co., John A. (358–360) Vibrating
Separations Engineering Corp. (52)
Simplicity Engineering Co. (706)
Sturtevant Mill Co. (3) Vibrating
Syntron Co. (311–313) Vibrating
Tyler Co., The W. S. (88)
Williams Patent Crusher & Pulverizer Co. (295) Vibrating
Bramley Machinery Corp. (524–525) Paint
Richmond Mfg. Co. (519)

SCREENS (OTHER)
Day Co., The J. H. (718)
Falstrom Co. (510–511)
General American Transportation Corp. (285–287)
Great Western Manufacturing Co. (372–374)
Gump Co., B. F. (362–364) Rotary
Link-Belt Co. (715–717) Water Intake
Newark Wire Cloth Co. (83–84)
Patterson Foundry & Machine Co., The (707–708) Revolving
Productive Equipment Corp. (549)
Roebling's Sons Co., John A. (358–360)
Tyler Co., The W. S. (88)
York Co., Inc., Otto H. (380) Separator
Bartlett & Snow Co., The C. O. (427–428)
Richmond Mfg. Co. (519)

Whether corrosives are





Worthington Worthite Type CG Transfer Pumps on distillery slop evaporators at Brown-Forman Distillers Corp., Louisville, Ky. Besides handling the stillage, which is corrosive, these pumps also circulate mild muriatic acid and boiling caustic solutions for weekly cleaning of the evaporator. Worthite Pumps are unaffected by any of these corrosive solutions, and repairs are nil.

WORTHINGTON WORTHITE PUMPS HANDLE THEM AT LOWEST COST PER YEAR OF SERVICE

For fifteen years Worthington Worthite Pumps have been demonstrating their ability to handle both weak and strong acids and alkalis at lowest cost. Today, for mildly corrosive applications — including distilled water — the economy of using Worthite Super-Stainless Alloy Pumps in place of all-iron, bronze and ordinary stainless alloy pumps is a matter of record. That's entirely logical, because:

Worthington Worthite Pumps are designed to give best results with corrosive fluids of ALL strengths. Their exceptional resistance to corrosion and abrasion means very much longer life. Trouble-free operation reduces maintenance expense to rock-bottom. Volume production, with integrated designs and maximum interchangeability of parts, assures the best available materials at relatively lowest unit costs.

Whether your applications are mild or severe, put these advantages to work for you — and cut the costs of corrosion! Worthington Worthite Pumps are built in standard sizes, from 1 to 20,000 gpm. For further proof that *there's more worth in Worthington*, call our nearest District Office Or write to *Worthington Pump and Machinery Corporation, Centrifugal Pump Division, Harrison, N. J.*

WORTHINGTON

VISIT US at Booths 319 and 321 at the Chemical Exposition, November 28 — December 3 Grand Central Palace, New York City

THE WORLD'S BROADEST LINE ASSURES YOU THE RIGHT PUMP FOR EVERY JOB

Types CG and CGL. Sizes ¾" to 10". Capacities to 3000 GPM; heads to 200 ft. Liquid ends of WORTHITE alloy.

Type CF. Sizes 1" to 4". Capacities to 1000 GPM; heads to 130 ft. Standard, all iron and all bronze.

Type CD. Sizes 1½" to 3". Capacities to 600 GPM; heads to 120 ft. at 1750 RPM. Closed impeller. WORTHITE shaft and fittings.

Type L. Sizes 3" to 8". Capacities to 2250 GPM; heads to 300 ft. Single stage volute. For general service.

Guide & Directory Page 69

What filter base do you need?

☐ COTTON ☐ GLASS
☐ WOOL ☐ ASBESTOS
☐ PAPER ☐ RUBBER
☐ NYLON ☐ WOVEN METAL
☐ VINYON ☐ OTHER

• You name it . . . Sperry can supply any type or any size for a wide range of industrial applications. Or take advantage of Sperry's experience in selecting the right base for your particular application. Sperry engineers are at your service.

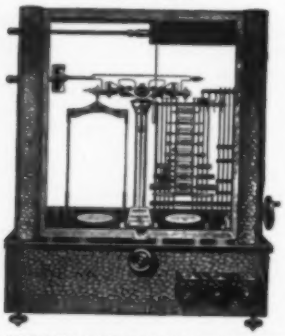
D. R. SPERRY & CO. Batavia, Illinois

Filtration engineers for over 50 years

SPERRY FILTER BASES

For Precision and Simplicity see the "Speedigram"

Booth 618



THE NEW VOLAND SPEEDIGRAM BALANCE is the latest American development in speed weighing *with accuracy.* The balance is sensitive to 0.05 mgs. at its full load of 200 grams on each pan. Unknown weights have been consistently obtained to 0.0001 gm. within one minute by inexperienced operators.

By means of a simple mechanism, operated from outside the case, the "Speedigram" places stainless steel and aluminum weights, adjusted to class "S" tolerances, on a specially designed hanger as selected. The three numbered dials which control these weights read directly up to 99.9 grams. The final 100 mgs. are controlled by the vinigram.

STANDARD SCIENTIFIC SUPPLY CORP.
34 West 4th Street • New York 12, N. Y.

BOOTH 618
342

Guide & Directory Page 70

EXHIBITORS Classified by Products

SEALING MACHINES
Aluminum Co. of America (70–71)
Chase Equipment Co. (547)
Pneumatic Scale Corp. Ltd. (22)
Popper & Klein Inc. (209–211 & 370)

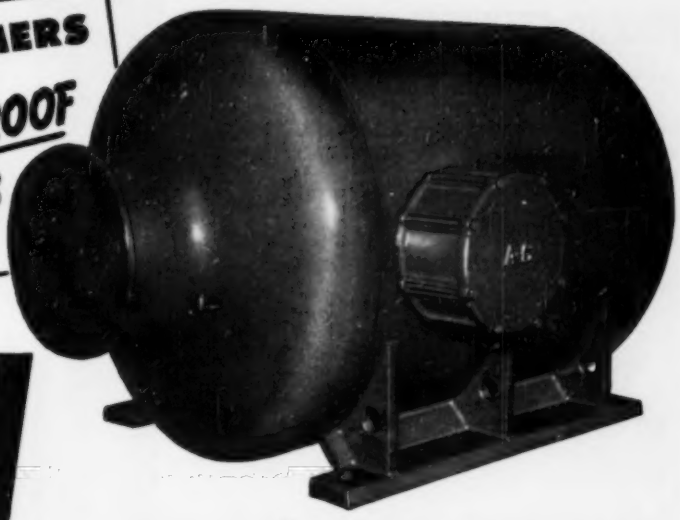
SEPARATORS (KIND)
American Tool & Machine Co. (412) Centrifugal
Combustion Engineering—Superheater Inc.—Raymond Pulverizer Div. (67) Mechanical Air Separators
Day Co., The (450) Dust
DeLaval Separator Co. (323) Continuous
Eriez Manufacturing Co. (631–632) Magnetic
General American Transportation Corp. (285–287)
Great Western Manufacturing Co. (372–374) Magnetic & Non-Magnetic
Hardinge Company Incorporated (60) Wet & Dry Process
Haveg Corp. (51)
Jeffrey Manufacturing Co., The (44A-45) Magnetic
Knap Mills Inc.—Andrews-Knapp Construction Co., Inc., (23) Lead
Lead Lined Iron Pipe Co. (23) Lead
Merco Centrifugal Co. (448) Continuous Centrifugal
Plate & Welding Div.—General American Transportation Corp. (285–287)
Schneible Co., Claude B. (421–422) Dust
Schutte & Koerting Co. (291) Steam
Selas Corp. of America (533–534) Liquid & Gas (Emulsion)
Separations Engineering Corp. (52) Specific Gravity Separators, Electrostatic Separators, Magnetic & Stoners
Sprout, Waldron & Co., Inc. (550–553) Screen & Air
Sturtevant Mill Co. (3) Air
Tolhurst Centrifugals Div. American Machine & Metals, Inc. (68–69) Centrifugal
Williams Patent Crusher & Pulverizer Co. (295) Air
York Co., Inc., Otto H. (380) Entrainment, Gas-Liquid

SHEET METAL WORK
Aluminum Co. of America (70–71)
Blickman Inc., S. (474–475) Stainless & Alloy
Day Co., The (450)
Falstrom Co. (510–511)
Glengarry Processes Inc. (564)
Great Western Manufacturing Co. (372–374)
Koven & Brother, Inc., L. O. (304–306)
Rockwell Co., W. S. (447)
Sturtevant Mill Co. (3)
Makepeace Co., D. E. (453)

SIEVES, LABORATORY
American Instrument Co., Inc. (385–387)
Fisher Scientific Co.—Eimer & Amend (57)
General Laboratory Supply Co. (711)
Great Western Manufacturing Co. (372–374)
Machlett & Son, E. (381 & A)
Newark Wire Cloth Co. (83–84)
Precision Scientific Co. (701–702)
Syntron Co. (311–313)
Richmond Mfg. Co. (519)
Tyler Co., The W. S. (88)
Will Corp. (225–227)

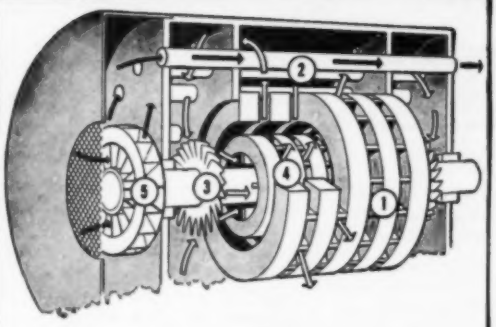
ALLIS-CHALMERS

EXPLOSION-PROOF MOTORS



NEW TUBE-TYPE FAN-COOLED DESIGN

How Tube Cooling Works



Stator core (1) is surrounded by tubes (2). Internal fans (3) circulate air through ducts (4) in rotor and stator and around tubes, transferring heat to tubes.

External fan (5) drives outside air through tubes, removing heat and keeping tubes clean. All electrical parts are enclosed. Dirt cannot enter.

- **Heat exchanger is practically self-cleaning**
- **Install anywhere – indoors or out**
- **75 hp and up – for 1-D or 2-G locations**

FOR HAZARDOUS LOCATIONS the design of the tube-type heat exchanger in this Allis-Chalmers explosion-proof motor cuts maintenance costs to a new low. Large heat transfer area plus internal and external forced air circulation removes heat quickly. Cleaning is practically eliminated because the air passages are unrestricted. Air flow through the straight tubes removes foreign matter.

Three years of operation in the field have shown that savings in maintenance can be made with this cooling arrangement. Sizes from 75 to 600 hp carry Underwriter's label. Larger sizes built on special order. Also TEFC* designs for non-hazardous locations. For complete information, outline your requirements to your A-C Sales Office, or write for Bulletins 05B7150 and 51R7149.

*Totally-Enclosed Fan Cooled

A-2609

ALLIS-CHALMERS, 1147A SO. 70 ST
MILWAUKEE, WIS.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

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MICRO METALLIC

POROUS STAINLESS STEEL FILTERS

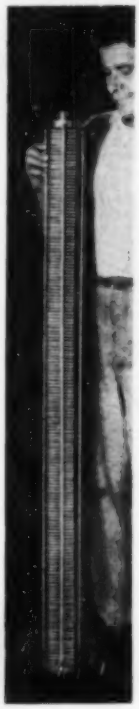
TAKE TWO BIG STEPS FORWARD

SURFAMAX SMALL
filters—1/10 to 20 sq. ft. for pilot plant and small production jobs

SURFAMAX BIG
filters—20 to 2000 sq. ft. for the full scale production job

- ECONOMY — Prices are competitive on first cost of all sizes —no filter media replacement costs.
- EFFICIENCY — due to close control of filter porosity, and to many valuable design features.

Your inquiry for descriptive literature, or for information on your specific problem, will be welcomed.



MICROMETALLIC CORPORATION
193 BRADFORD ST. / BROOKLYN 7, N. Y.

CUT CORROSION COSTS!

REDUCE DOWNTIME IN YOUR PLANT!

HOW? WITH ILLIUM

the superior corrosion-resisting alloy

● Over twenty years of commercial application have proved ILLIUM to be the outstanding cost cutter in successfully combating the corrosion of sulphuric, nitric, phosphoric, mixed acids, and various acid salt combinations in hundreds of industrial plants.

● No other metal is so versatile! ILLIUM can be cast, machined, welded, rolled, bent and formed to make simple or complex parts, fittings, or complete assemblies. Now, with the introduction of ILLIUM in welded tube form, the field of applications for this superior corrosion-resisting metal is virtually unlimited.

● INVESTIGATE ILLIUM for acid pump parts, acid tank hardware, staple cutter blades, mixing and agitating equipment, orifice discs and venturi meters, spray nozzles, pipe, valves, fittings, kettles, and a multitude of other applications for which ILLIUM has already proved itself.

at the Chemical Exposition... Nov. 28 to Dec. 3 Grand Central Palace... Booth 661

Tell our engineers your corrosion problem and they will demonstrate how you can save your plant from component failure and breakdown; or simply state your corrosion problem on your letterhead and mail to Department CE-11.

BURGESS-PARR COMPANY FREEPORT, ILLINOIS

BOOTH 661

Guide & Directory Page 72

EXHIBITORS
Classified by Products

SIFTERS
- Great Western Manufacturing Co. (372–374)
- Gump Co., B. F. (362–364)
- Patterson Foundry & Machine Co., The (707–708)
- Read Machinery Div. of The Standard Stoker Co., Inc. (280)
- Richmond Mfg. Co. (519)
- Rodgers Co., George G. (612)
- Separations Engineering Corp. (52)
- Tyler Co., The W. S. (88)
- Wallace & Tiernan Co., Inc. (519–521)

SILICA
- Ansersil Co., Inc. (454–455)
- Dicalite Div.—Great Lakes Carbon Corp. (86) Diatomaceous
- Hanovia Chemical & Manufacturing Co. (458–459) Fused
- Johns Manville (93–94) Diatomaceous

SINKS, LABORATORY, ACID PROOF
- Alberene Stone Corp. of Virginia (79)
- Aloe Co., A. S. (720)
- Blickman Inc., S. (474–475)
- Duriron Co., Inc., The (19–20)
- Fisher Scientific Co.,—Eimer & Amend (57)
- General Ceramics & Steatite Corp. (2)
- Haveg Corp. (51)
- Kewanee Manufacturing Co. (308–310)
- Knight, Maurice A. (53)
- Koven & Brother Inc., L. O. (304–305)
- Laboratory Furniture Co., Inc. (221–223)
- Luzerne Rubber Co. The (528–529)
- Sheldon & Co., E. H. (255)
- Sjostrom Co., John E. (664)
- U. S. Stoneware Co., The (89–91)

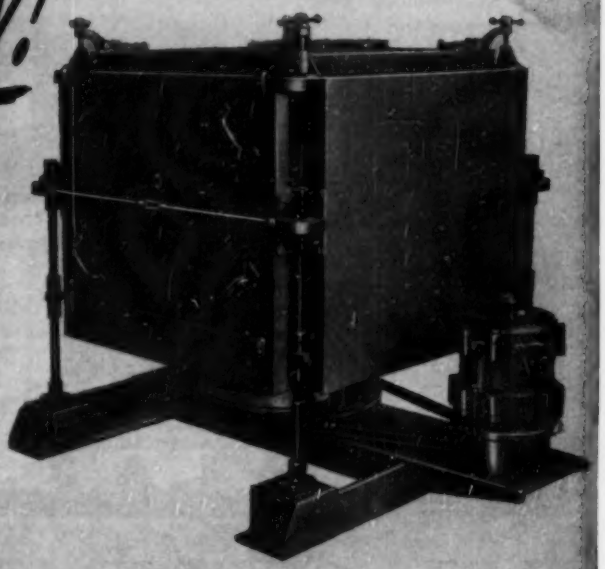
SIZERS
- American Polymer Corp. (35–36)
- Dorr Co., Inc., The (64)
- General American Transportation Corp. (285–287)
- Plate & Welding Div.—General American Transportation Corp (285–287)

SOLVENT RECOVERY EQUIPMENT
- Allis-Chalmers Manufacturing Co. (48–49)
- Aluminum Co. of America (70–71)
- Artisan Metal Products Inc.,—Henry E. Jacoby (540–542)
- Blaw-Knox Co. (13–14)
- Buflovak Equipment Div.—Blaw-Knox Co. (6)
- Carbide & Carbon Chemicals Corp. (17–18 & 92)
- Goslin-Birmingham Manufacturing Co., Inc. (74)
- Koch Engineering Co., Inc. (479–480)
- Patterson Foundry & Machine Co., The (707–708)
- Pfaudler Co., The (72–73)
- Republic Seitz Filter Corp. (557)
- Selas Corp. of America (533–534)
- Stokes Machine Co., F. J. (80)

SOLVENTS
- American Resinous Chemicals Corp. (35–36)
- Carbide & Carbon Chemicals Corp. (17–18 & 92)
- Commercial Solvents Corp. (55)
- General Electric Apparatus Dept. (4)
- Hercules Powder Co. (7W)
- Koppers Co., Inc.—Chemical Div. (264)
- Oronite Chemical Co. (705)
- Socony-Vacuum Oil Co., Inc. (324–326)

It's New!

All-Metal
SIFTER
for the
CHEMICAL
INDUSTRY



Designed to handle High Temperature Materials

HERE'S A NEW *Low-Head* gyratory sifter for the chemical industry. It's the Allis-Chalmers all-metal sifter — patterned after the *Low-Head* standard gyratory sifter — but new and different because it's made entirely of *metal!*

High temperature materials can be sifted in this machine since there are no wooden parts to be affected. And cleaning is a simple matter. It can be easily and safely *washed.*

Numerous materials — ranging from pure chemical products such as *barium nitrate* to impure metallurgical products such as *zinc concentrate* — can be efficiently handled by this all-metal sifter.

Compactly constructed of steel and magnesium, the *Low-Head* all-metal gyratory sifter is a high speed, high capacity machine holding four to seven sieves. Sieve screens can be silk or metal, with a variety of mesh to choose from.

The all-metal sifter is available *now!* Send coupon for details.

Low-Head is an Allis-Chalmers trademark.

A-2866
ALLIS-CHALMERS, 1147A SO. 70 ST
MILWAUKEE, WIS.

☐ Please send handy packet with information on new All-Metal sifter and standard sifter bulletin 0686124A.

☐ Would like personal visit from A-C representative with details of new sifter.

Name

Company

Street

City State

ALLIS-CHALMERS
CHEMICAL MILLING AND PROCESSING EQUIPMENT

Guide & Directory Page 73

YOUR *New* LABORATORY...

from a rough to Reality!

Send for this new Complete Catalog on Laboratory Furniture and Equipment.

Planning a new Lab? Adding to your present equipment? Metalab will give you expert advice on:—

- How to plan your lab for operating efficiency
- How interchangeable Sectional Units are used
- How to get the most for your laboratory budget

Our superior manufacturing facilities result in top quality and economy—features which have made Metalab the choice of many of the nation's leading laboratories.

Consult us for suggested layouts, specifications, and estimates—without obligation... Rush that problem to us today!

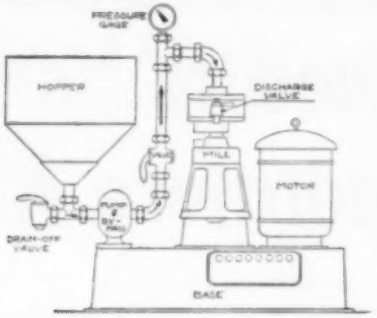
SECTIONAL LABORATORY FURNITURE and EQUIPMENT by

METALAB Equipment Corp.

1521 Dean St., Brooklyn 13, N. Y.

Eppenbach Introduces

A VERTICAL PRESSURE-FEED COLLOID MILL



This Pressure-Feed Colloid Mill combines in one complete package a vertical Eppenbach Stainless Steel Colloid Mill plus a Positive Acting Pump. This combination permits pressure feeding of materials, at pressure up to several hundred pounds per square inch, directly into the grinding chamber.

This method of feeding increases mill capacity at finer micrometer-gap settings. Excellent for processing heavier viscosity creams and pastes. Available in models from 1½ hp up.

Successfully tested on products such as cold milling of cosmetic creams, grinding of mustard, ink and paint pastes, etc.

Pump and fittings are furnishing in stainless steel or other alloys, designed for easy disassembly and cleaning.

See this Mill and others at the New York Chemical Show BOOTH 278

EPPENBACH, *Incorporated*

45-10 VERNON BLVD., LONG ISLAND CITY 1, N. Y.

Booth 278

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EXHIBITORS Classified by Products CONTINUED

SPEED REDUCERS

Allis-Chalmers Manufacturing Co. (48–49)
Cleveland Worm & Gear Co. (502–503)
Denver Equipment Co. (507)
Link-Belt Co. (715–717)
Philadelphia Gear Works, Inc. (78) All Kinds
Reeves Pulley Co. (34)
U. S. Electrical Motors, Inc. (659A–662A)

SPRAY DRYING SYSTEMS

Bowen Engineering Inc. (400–400A)
Buflovak Equipment Div.—Blow-Knox Co. (6)
Glengarry Processes, Inc. (564)
Swenson Evaporator Co.—Div. of Whiting Corp. (43)

STAIR STEPS, SAFETY

Knapp Mills, Inc.—Andrews-Knapp Construction Co., Inc. (23)
Lead Lined Iron Pipe Co. (23)
Lukens Steel Co. & Divisions—By-products Steel Co. & Lukenweld (588–563)
Republic Steel Corp. (434–436)

STEEL GRATING AND FLOORING

Blaw-Knox Co. (13–14)
Koven & Brother Inc., L. O. (304–306)
Republic Steel Corp. (434–436)
U. S. Steel Corp. (76–77)

STERLIZERS

Barnstead Still & Sterlizer Co. (229–231)
Electric Hotpack Co., Inc., The (655–656)
Fisher Scientific Co.—Eimer & Amend (57)
General Laboratory Supply Co. (711)
Koven & Brother Inc., L. O. (304–306)
Machlett & Son, E. (381 & A)
Patterson Foundry & Machine Co., The (707–708)
Standard Scientific Supply Corp. (618)
Welch Manufacturing Co., W. M. (405–406)
Will Corp. (225–227) Laboratory

STILLS (KIND)

Aetna Scientific Co. (668)
Ampco Metal, Inc. (268)
Artisan Metal Products, Inc. (540–542)—Henry E. Jacoby—All Kinds
Barnstead Still & Sterlizer Co. (229–231) Water
Blaw-Knox Co. (13–14)
Buflovak Equipment Div.—Blaw-Knox Co. (6)
Electric Hotpack Co., Inc., The (655–656) Water
Fansteel Metallurgical Corp. (282–284) Acid
Fisher Scientific Co.—Eimer & Amend (57) Laboratory
General Ceramics & Steatite Corp. (2)
General Laboratory Supply Co. (711) Water
Glascote Products, Inc. (657–658) Glass Lined & Alloy
Haveg Corp. (51)
Illinois Water Treatment Co. (611) Ion Exchange
Koven & Brother Inc., L. O. (304–306) Jacketed — Pressure-Vacuum — Including Complete Condensing & Fractionating Systems. Examples—Amonia Stills — Alcohol Stills—Jacketed Stills & Condenser—Distilling Apparatus with Jacketed Fractionators — Jacketed Vacuum Stills with Agitator & Condenser

EXHIBITORS • Classified by Products • CONTINUED

Machlett & Son, E. (381 & A)
New York Laboratory Supply Co., Inc. (218) Laboratory
Pfaudler Co., The (72-73)
Stokes Machine Co., F. J. (80) Vacuum Atmos
Welch Manufacturing Co., W. M. (405-406)
Will Corp. (225-227)

STRAINERS

Bowser, Inc. (461A)
Great Western Manufacturing Co. (372-374)
Haveg Corp. (51)
Illinois Electric Porcelain Co. (672-673)
Leslie Co. (676-677)
Luzerne Rubber Co., The (528-529)
Micro Metallic Corp. (671)
Monarch Manufacturing Works, Inc. (354)
Newark Wire Cloth Co. (83-84)
Sarco Co., Inc. (11)
Schutte & Koerting Co. (291)
York Co., Inc., Otto H. (380) Wire Mesh

STRAPPING, STEEL

SWITCHES

Allis-Chalmers Manufacturing Co. (48-49)
Austenal Laboratoris, Inc. (573A)
General Electric Apparatus Sept. (4)
Magnetrol, Inc. (724)

TACHOMETERS

Bailey Meter Co. (56)
Builders-Providence, Inc. (493-495)
Equipoise Controls, Inc. (471) Hand
General Electric Apparatus Dept. (4)
Machlett & Son, E. (381 & A)
Martindale Electric Co. (440)
Minneapolis-Honeywell Regulator Co. (4041) Brown Instrument Div.—Indicators & Recorders
Weston Electrical Instrument Corp. (263)

TANKS (KIND)

Alsop Engineering Corp. (293) Opened and Closed Mixing & Storage—in Stainless Steel, Monel, Nickel, Etc.
Aluminum Co. of America (70-71)
American Hard Rubber Co. (303-305) Rubber Lined
Ampco Metal, Inc. (268) Non-Ferrous-Made to Order
Artisan Metal Products, Inc. (540-542) Henry E. Jacoby—All Kinds
Blaw-Knox Co. (13-14)
Blickman Inc., S. (474-475) Stainless & Alloy
Denver Equipment Co. (507) Steel & Wood
Electric Hotpack Co., Inc., The (655-656) Baths, Constant Temperature
Falstrom Co. (510-511) Steel—Non-Pressure
General Alloys Co. (299) Stainless Steel
General American Transportation Corp. (285-287) Cars—Tank Car Division
General Ceramics & Steatite Corp. (2) Stoneware
Glascote Products, Inc. (657-658) Glass Lined & Alloy
Haveg Corp. (51)
Heil Process Equipment Corp. (539) Clad Metals, Lead, Monel, Nickel, Stainless Steel, Tanks Lined—Lead, Rubber & Various Materials
Hercules Filter Corp. (443-445)
Knapp Mills, Inc.—Andrews-Knapp Construction Co., Inc. (23)
Knight, Maurice A. (53)
Koven & Brother, Inc., L. O. (304-306) Process & Storage—Any Shape or Size or Material—Chemical, Blow-off, Booster, Carbonating, Caustic, Cleaning, Classifier, Expansion, Gasoline, Heating, Marine, etc. in Every Field and for every use. Field Erected
Lead Lined Iron Pipe Co. (23)
Luzerne Rubber Co., The (528-529) Hard Rubber
Metal Glass Products Co., Inc. (425-426) Stainless Steel
Moore Co., J. Arthur (512-513) Glass Lined
National Carbon Co., Inc. (30-31) Carbon & Graphite
National Lead Co. (247) Lead
New England Tank & Tower Co. (50) Agitated
Pfaudler Co., The (72-73)
Plate & Welding Div. General American Transportation Corp. (285-287)
Pressed Steel Tank Co. (348-352)
Rodges Co., George G. (612) Stainless all Types
U. S. Stoneware Co., The (89-91) Metal, Rubber, Plastic, Phenolic, Duralon-lined

THERMOMETERS

Aloe Co., A. S. (720)
American Instrument Co., Inc. (385-387)
Bailey Meter Co. (56)
Electric Hotpack Co., Inc., The (655-656)
Energy Control., Inc. (722)
Equipoise Controls, Inc. (471) Dial
General Laboratory Supply Co. (711)
Greiner Co., The Emil (226-228)
Illinois Testing Laboratories, Inc. (38-39)
Kimble Glass Div. of Owens-Illinois Glass Co. (342-344) Industrial
Minneapolis-Honeywell Regulator Co. (40-41) Brown Instrument Division—Indicating, Recording, & Controlling Models
Moore Co., J. Arthur (512-513)
New York Laboratory Supply Co., Inc. (218)
Precision Scientific Co. (701-702)
Sarco Co., Inc. (11)
Thomas Co., Arthur H. (665-666)
Welch Manufacturing Co., W. M. (405-406)
Weston Electrical Instrument Corp. (263)
Will Corp. (225-227)

THICKENING AND DEWATERING MACHINERY

American Tool & Machine Co. (412)
Baker Perkins, Inc. (62-63)
Bird Machine Co. (535-536 & 543-544)
Denver Equipment Co. (507)
Dorr Company, Inc., The (64)
Filtration Engineers Incorporated (8)
Fletcher Works, Inc. (33)
General American Transportation Corp. (285-287)
Link-Belt Co. (715-717)
Patterson Foundry & Machine Co., The (707-708)
Shriver & Co., Inc., T. (12)
Syntron Co. (311-313)
Tolhurst Centrifugals Div. of American Machine & Metals, Inc. (68-69)
Tyler Co., The W. S. (88)

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PULVERIZING
TRITURATING
SHREDDING
DEFIBERIZING
DISPERSING

Rietz

DISINTEGRATORS

last longer

. . . because of heavy duty construction, extra-heavy shaft, manganese steel hammers, and heavy gauge, heat-treated screens.

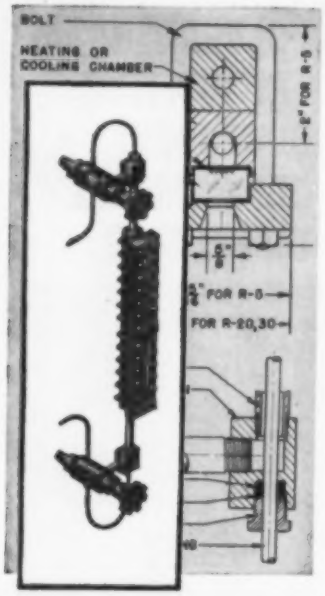
12 STANDARD MODELS

5 to 300 HP—Stainless Steel Optional

. . . versatile because each machine designed and tested for high speed (3600) operation, but provided with motors of either 1800 RPM or 3600 RPM, depending on application.

Rietz MANUFACTURING CO.
441 FOLSOM ST.
SAN FRANCISCO 5, CALIF.

See our exhibit—Booth 648, New York Chemical Show



JERGUSON HEATED AND COOLED GAGES
Give Accurate Readings Under All Conditions

USE Jerguson Heated Gages for accuracy if you are dealing with high viscosity liquids that flow sluggishly.

On the other hand, if you are dealing with highly volatile liquids which tend to boil, use Jerguson Cooled Gages with circulating cooling medium.

In either case, Jerguson engineers have the answer, with a complete line of gages that give accurate reading of *all* liquids under *all* temperature conditions.

Jerguson Heated-Cooled Gages are made in internal tube and double chamber models for all pressures.

Illustration shows Internal Tube Model, Reflex Type, with No. 93 Valves. Write for Data Unit No. 17.

JERGUSON
GAGE & VALVE COMPANY
100 Fellsway, Somerville 45, Mass.
Representatives in Major Cities
Phone Listed Under JERGUSON

EXHIBITORS • Classified by Products • CONTINUED

TOWER PACKING AND FILLING

Aluminum Co. of America (70–71)
Amersil Co., Inc. (454–455)
General Ceramics & Steatite Corp. (2)
Haveg Corp. (51)
Johns-Manville (93–94)
Knight, Maurice A. (53)
Koch Engineering Co., Inc. (479–480)
Lapp Insulator Co., Inc. (441–442)
National Carbon Co., Inc. (30–31)
Scientific Glass Apparatus Co., Inc. (215–219)
U. S. Stoneware Co., The (89–91)
York Co., Inc., Otto H. (380)

TOWERS

Aluminum Co. of America (70–71)
American Hard Rubber Co. (303–305) Rubber Lined
Ampco Metal, Inc. (268)
Blaw-Knox Co. (13–14)
Blickman Inc., S. (474–475)
Combustion Engrg., Superheater, Inc. (269)
General American Transportation Corp. (285–287)
General Ceramics & Steatite Corp. (2)
Haveg Corp. (51)
Knight, Maurice A. (53)
Koch Engineering Co., Inc. (479–480)
Koven & Brother, Inc., L. O. (304–306)
Lapp Insulator Co., Inc. (441–442)
National Carbon Co., Inc. (30–31)
Pfaudler Co., The (72–73)
Plate & Welding Div.—General American Transportation Corp. (285–287)
U. S. Stoneware Co., The (89–91)

TRANSMISSION EQUIPMENT

Allis-Chalmers Manufacturing Co. (48–49)
Aluminum Co. of America (70–71)
General Electric Apparatus Dept. (4)
Great Western Manufacturing Co. (372–374)
Jeffrey Manufacturing Co., The (44A–45)
Link-Belt Co. (715–717) Chains, Conveyor & Elevator Chains Power Transmission, Power Transmission Machinery, Pulleys, Conveyors
Reeves Pulley Co. (34)
Reliance Electric & Engrg Co. (674–675)

TUBES (KIND)

Allegheny Ludlum Steel Corp. (250–254) Stainless
Aloe Co., A. S. (720) Laboratory
Aluminum Co. of America (70–71)
American Hard Rubber Co. (303–305) Hard Rubber & Plastics
Ampco Metal, Inc. (268) Condenser—Corrosion Resistant Aluminum & Bronze
Builders-Providence, Inc. (493–495) Venturi
Carpenter Steel Co., The (500–501) Alloy Tube Division—Stainless Steel Heat Exchangers
Crucible Steel Co. of America (635) Stainless Steel
Fansteel Metallurgical Corp. (282–284) Tantalum
Fischer & Porter Co. (203–207) Precision—Bore Glass
Haveg Corp. (51)
Luzerne Rubber Co., The (528–529) Hard Rubber
Machlett & Son, E. (381 & A)
Metal Glass Products Co., Inc. (425–426) Collapsible
National Carbon Co., Inc. (30–31) Imperious Graphite
Norton Co. (415–416) Porous—Pyrometer—Refractory
Process & Instrument (518) Mass Spectrometer
Republic Steel Corp. (434–436) Steel
Schutte & Koerting Co. (291) Radiafin
Titanium Alloy Manufacturing Div.—National Lead Co. (366–368) Refactory
Tri-Clover Machine Co. (498) Stainless
U. S. Stoneware Co., The (89–91) Flexible Plastic Tubings
U. S. Steel Corp. (76–77)

ULTRA VIOLET LAMPS

Denver Equipment Co. (507)
Fisher Scientific Co.—Elmer & Amend (57)
Gamma Scientific Co. (497)
General Electric Apparatus Dept. (4)
Hanovia Chemical & Manufacturing Co. (458–459)
Machlett & Son, E. (381 & A)
Will Corp. (225–227)

VALVES AND FITTINGS

Alloy Steel Products Co. (646–647)
Aluminum Co. of America (70–71)
American Hard Rubber Co. (303–305) Hard Rubber, Rubber Lined
Ampco Metal, Inc. (268) Plug—Corrosion Resistant
Austenal Laboratories, Inc. (573A)
Black, Sivalss & Bryson Inc. (496)
Blaw-Knox Co. (13–14)
Cooper Alloy Foundry Co., The (565–566) Stainless Steel, Nickel, Monel
Corning Glass Works (391–395) Glass
Crane Co. (297)
DeZurik Shower Co. (723)
Duriron Co., Inc., The (19–20)
Energy Control, Inc., Co. (722)
Farris Engineering Corp. (662) Valves
Fischer & Porter Co. (203–207)
General Ceramics & Steatite Corp. (2)
Grinnell Co., Inc. (251)
Hasco Valve & Machine Co. (569) Alloy
Haveg Corp. (51)
Hills-McCanna Co. (346) Diaphragm & Air Operated
Hoke Incorporated (213)
Knapp Mills, Inc.—Andrews-Knapp Construction Co., Inc. (23)
Knight, Maurice A. (53)
Ladish Co. (613–614)
Lapp Insulator Co., Inc. (441–442)
Lead Lined Iron Pipe Co. (23)
Luzerne Rubber Co., The (528–529) Hard Rubber
Minneapolis-Honeywell Regulator Co. (40–41) Brown Instrument Division—Diaphragm Electric Motor and manually operated Valves, including High Life and Low Lift Styles, Transfer Valve and By-Pass
National Carbon Co., Inc. (30–31)
National Lead Co. (247)
Nordstrom Valve Div. Rockwell Mfg. Co. (25)
Parker Appliance Co., The (21)
Pfaudler Co., The (72–73)
Pittsburgh Equitable Meter Div. Rockwell Mfg. Co. (61)
Powell Co., The Wm. (54)
Precision Scientific Co. (701–702)
Rockwell Co., W. S. (447)
Saran Lined Pipe Co. (621)
Schutte & Koerting Co. (291)
Tri-Clover Machine Co. (498)
U. S. Stoneware Co., The (89–91)
Walworth Co. (316–318) Full line, Steel, Iron, Bronze, Stainless, & Special Alloys
Weston Electrical Instrument Corp. (263)

VENTILATING APPARATUS

Aluminum Co. of America (70–71)
Falstron Co. (510–511)

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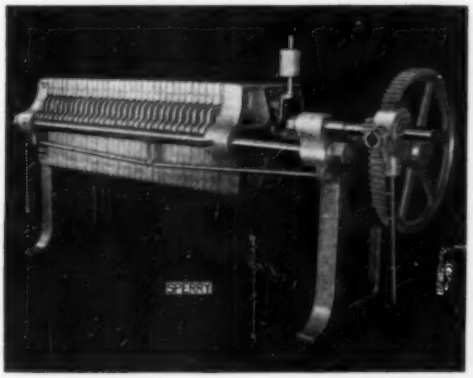
Flexibility...

AN EXTRA VALUE IN THE SPERRY FILTER PRESS



Flexibility, as applied to the Sperry Filter Press, gives you these definite advantages . . . all important factors in the purchase of process equipment:

Efficient operation under many varying conditions.

High, medium or low pressure filtration.

The use of any filter medium.

The handling of any filterable mixture (including viscous), either hot or cold with precise temperature control if required.

Add ECONOMY (low first cost, low maintenance), SIMPLE CONSTRUCTION (easy to install, easy to operate) and UNIFORMITY OF PRODUCT . . . and you have the reasons behind universal acceptance of the Sperry Filter Press. Sperry engineers are always available to help put these advantages to work for you. Call on them today!

D. R. SPERRY & COMPANY

BATAVIA, ILLINOIS • Filtration Engineers for over 50 years

Eastern Sales Representative: H. E. Jacoby, M. E. • 205 E. 42nd St., New York 17, N. Y. • phone: MUrray Hill 4-3581

Western Sales Representative: B. M. Pilhashy • 833 Merchants Exchange Bldg., San Francisco 4, Cal. • phone: Do 0375

SPERRY FILTER PRESSES

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For pumping acids, caustics, slurries, viscous liquids, *specify...*

JABSCO
Corrosion Resistant
PUMPS

Patented and Pats. Pend.

SELF PRIMING. Obtains vacuum in excess of 26".

VERSATILE. Handles variety of liquids and slurries at wide range of speeds.

SAFE. Self-priming feature permits cleaner, safer, more accessible installations.

SIMPLE. Easily and quickly disassembled for cleaning.

TROUBLE FREE. Impeller lubricated by liquid pumped. No oil or grease cups. No packing. No metal to metal contact of moving parts. Ball bearings.

MORE CAPACITY for its size and price than any other type of pump. Capacities up to 56 GPM.

FLEXIBLE IMPELLER. Odorless, tasteless, non-toxic corrosion resistant neoprene—also gum rubber if specified.

Stainless Steel Models available in ⅜", 1", and 1½" port sizes.

Bronze Models available in ¼" up to 1¼" port sizes.
Cast Iron Models available in 1", 1¼" port sizes.

JABSCO PUMP COMPANY
2031 LINCOLN STREET • BURBANK, CALIFORNIA

In Well-Equipped, Modern Labs
it's ALBERENE
table tops, sinks and hoods

Esso Research Center of the Standard Oil Development Company at Linden, N. J. Over 12,000 square feet of Alberene Stone are used in the new lab's table tops and sinks.

You'll find many of the newest and finest laboratories in the country are equipped with table tops, sinks and hoods of Alberene Stone. Because Alberene Stone is a natural material that is highly corrosion-resistant . . . durable . . . and attractive. And . . . because Alberene Stone is easy to handle—easy to drill and cut.

Alberene offers you expert engineering assistance based on more than fifty years experience in equipping laboratories. For information and technical advice, just write Alberene Stone Corporation of Virginia, 419 Fourth Avenue, New York 16, N.Y. Or better yet—why not visit our nearest branch office?

Visit us at Booth No. 79 at the Chemical Show

ALBERENE STONE

BOOTH 791

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EXHIBITORS
Classified by Products
CONTINUED

Haveg Corp. (51)
Kewanee Manufacturing Co. (309–310)
Knight, Maurice A. (53)
Mine Safety Appliance Co. (376–378)
Niagara Blower Co. (233–235)
Schutte & Koerting Co. (291) Jet

VIBRATORS
Exact Weight Scale Co., The (472–473)
Great Western Manufacturing Co. (372–374)
Link-Belt Co. (715–717)
Syntron Co. (311–313)
Tyler Co., The W. S. (88)

WASTE TREATMENT PLANTS AND EQUIPMENT
Dorr Co., The (64)
Link-Belt Co. (715–717) Sludge Recovery Equipment Waste Recovery Systems

WATERPROOFING COMPOUNDS
Alrose Chemical Co. (489)
American Polymer Corp. (35–36)
American Resinous Chemicals Corp. (35–36)
Johns-Manville (93–94)
Titanium Alloy Manufacturing Div.—National Lead Co. (366–368)
Victor Chemical Works (729–734)

WATER CONDITIONING EQUIPMENT
Allis-Chalmers Manufacturing Co. (48–49)
American Hard Rubber Co. (303–305) Rubber Linings for
Barnstead Still & Sterilizer Co. (229–231) Demineralizers, Water
Beleo Industrila Equipment Div, Inc. (574) Demineralizers
Dorr Co., The (64)
Hardinge Company Incorporated (60)
Illinois Water Treatment Co. (611)
Lapp Insulator Co., Inc. (441–442)
Link-Belt Co. (715–717)
Luzerne Rubber Co., The (528–529)
Permutit Co., The (403–404)
%Proportioneers, Inc.% (477–478) Boiler Water Conditioning
Republic Seitz Filter Corp. (557)
Stokes Machine Co., F. J. (80)
Wallace & Tiernan Co., Inc. (519–521)

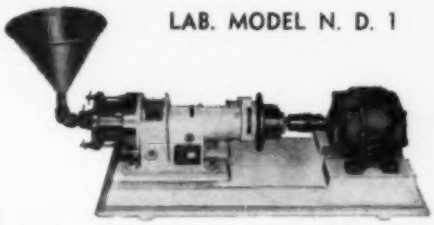
WAXES
American Resinous Chemicals Corp. (35–36) Concentrates of Vistanex, Polyethylene, Butyl & S. Polymere in Paraffin & Micro Waxes
Bareco Oil Co. (629–630) Petroleum Microcrystalline
Hercules Powder Co. (7W) Emulsions Synthetic
Will Corp. (225–227) Tissue Embedding

WELDING EQUIPMENT
Aluminum Co. of America (70–71)
Ampco Metal, Inc. (268) Electrodes—Corrosion Resistant Aluminum & Bronze
General Electric Apparatus Dept. (4)
Haynes Stellite Co. (92) Welding Rods—Electrodes
International Nickel Co., Inc., The (9–10) Electronics—Wire & Flux
Willson Products, Inc. (419–420)

CHARLOTTE COLLOID MILL
for PRODUCTION and LABORATORY
Better Service—New Applications—by Chemicolloid

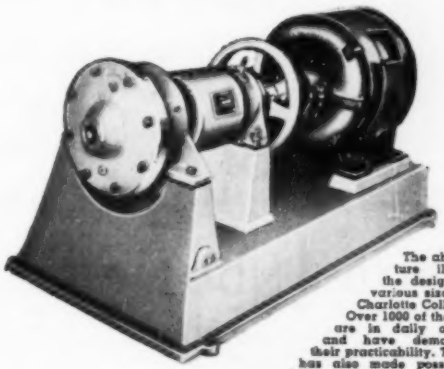
**VISIT OUR BOOTH NO. 257
AT THIS SHOW—SEE THESE MODELS**

LAB. MODEL N. D. 1



Developed to fill a long felt need for a sturdy production machine with which to conduct laboratory tests of reliable character. Also makes possible small scale production operations. Of the same principle and rugged construction which distinguish the larger models.

PRODUCTION MODEL NO. 20



The above picture illustrates the design of the various sizes of the Charlotte Colloid Mill. Over 1000 of these mills are in daily operation and have demonstrated their practicability. Their use has also made possible the development of many new products, and has contributed toward more efficient methods of production.

Used In These
19 INDUSTRIES

Food Products . . . Cosmetics . . . Pharmaceuticals . . . Paint and Pigments . . . Polishes . . . Asphalt and Tar . . . Insecticides . . . Waterproofing . . . Adhesives . . . Clays . . . Oils . . . Rayon . . . Rubber . . . Wax Products . . . Paper . . . Dyestuffs . . . Ink . . . Flooring . . . Textile.

If desired, we will schedule a laboratory test run on your process material without obligation to you.

Write for:

1. *A scheduled date for laboratory test run on your materials.*
2. *Further information on other Charlotte models.*

ANNIVERSARY 25th 1924-1949

CHEMICOLLOID LABS, Inc.

Sole Manufacturers and Distributors of the Charlotte Colloid Mill . . .

30 CHURCH ST., NEW YORK 7, N. Y.

District Offices: Baltimore • Chicago • Los Angeles • Detroit Atlanta • New Orleans

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for

DEPENDABILITY and ECONOMY

Specify

GUMP BUILT Equipment

DRAVER "Micro-Master" FEEDERS

For greater accuracy and control in feeding, by volume, of desired amounts of dry, flaked, granular or powdered material. Variable speed drive with micrometer-type control permits extremely close regulation of feeding rates.

BAR-NUN ROTARY SIFTERS

Large capacity rotary motion sifters. Provide thorough separations by particle size, of dry, flaked, granular and powdered materials. Can grade 2, 3, or 4 sizes of product. 9 models available for grading, scalping, or sifting applications.

VIBROX PACKERS

The vibrating-rocking action of Vibrox Barrel Packers compacts dry, flaked, powdered or granular materials so efficiently that these units soon repay their cost in savings on reduced container sizes and packing time.

AUTOMATIC Net WEIGHERS

Bar-Nun "Auto-Check" Net Weighers and Edtbauer-Duplex Automatic Net Weighers for extremely accurate net weights in ranges from 3 ounces to 75 pounds. For dry, free flowing and semi-free flowing materials.

See these machines at the

CHEMICAL EXPOSITION BOOTH NOS. 362–364

B.F. Gump Co.

ENGINEERS AND MANUFACTURERS SINCE 1872

1322 S. Cicero Ave., Chicago 50

EXHIBITORS • Classified by Products • CONTINUED

WIRE CLOTH

Aluminum Co. of America (70–71)
Baker & Co., Inc. (451–452)
General Laboratory Supply Co. (711)
Great Western Manufacturing Co. (372–374)
Gump Co., B. F. (362–364) Weigher's Automatic Net
Hercules Filter Corp. (443–445)
Industrial Steels, Inc. (649–650)
Metal Glass Products Co., Inc. (425–426) Stainless Steel
Newark Wire Cloth Co. (83–84)
Patterson Foundry & Machine Co., The (707–708)
Republic Seitz Filter Corp. (557)
Richmond Mfg. Co. (519)
Roebling's Sons Co., John A. (358–360)
Tyler Co., The W. S. (88)
U. S. Steel Corp. (76–77)
York Co., Inc., Otto H. (380)

WOOD FLOUR

Hercules Filter Corp. (443–445)
Richmond Mfg. Co. (519)

X-RAY EQUIPMENT

General Electric Apparatus Dept. (4)
Luzerne Rubber Co., The (528–529)

Compiled from information supplied to International Exposition Company. No responsibility assumed for errors or omissions.

VISIT

FOOD INDUSTRIES

AT

BOOTH 42

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You

are invited to inspect and discuss these LINK-BELT Products at the

22nd

EXPOSITION of CHEMICAL INDUSTRIES

Grand Central Palace, New York
Nov. 28 – Dec. 3
BOOTHS
715, 716, 717

We have planned the Link-Belt Exhibit not so much as a display booth but as an information bureau. You will see a full size Vibrating Screen; a display of the Roto-Louvre Dryer featuring installation pictures and actual dried product samples; a Bulk-Flo Conveyor model; a Screw Conveyor; Belt Conveyor Idlers and other Link-Belt equipment serving the Chemical Process Industries.

In addition, the Booths are manned by Link-Belt Engineers who have an intimate knowledge of the chemical industry. They will consider it a privilege to discuss your problems.

11,000

LINK-BELT COMPANY, Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices in Principal Cities.

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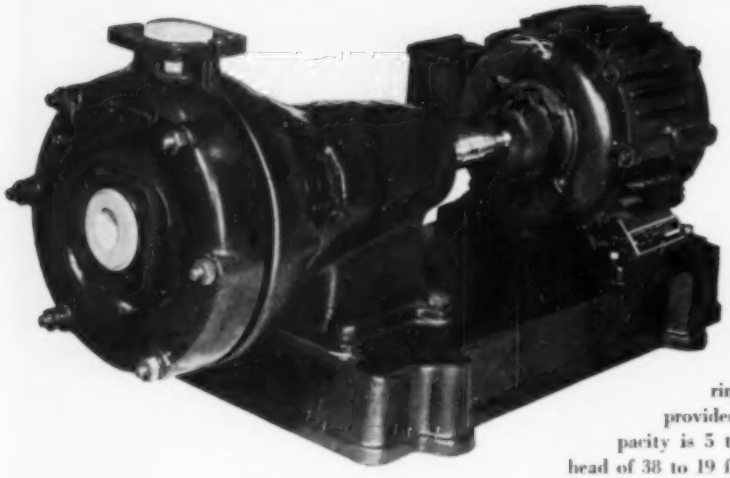
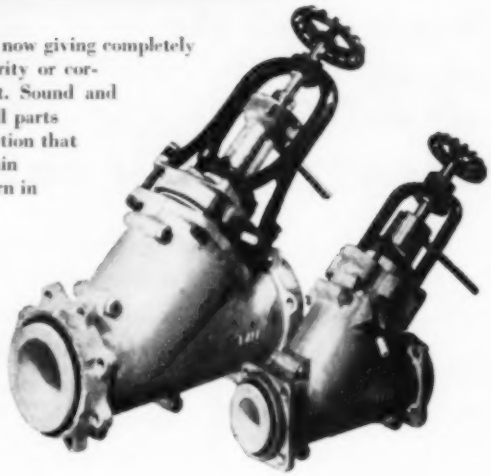
Lapp CHEMICAL PORCELAIN CENTRIFUGAL PUMP



• Here's the pump that brings the purity and corrosion-resistance of chemical porcelain to industrial production. All wet-end parts are solid chemical porcelain, a dense, thoroughly vitrified completely non-porous ceramic. For full operating security, all porcelain parts are completely encased in cast-iron armor. A spring-loaded running seal, consisting of a special ceramic ring running against a carbon ring, provides a non-contaminating seal. Capacity is 5 to 40 gpm, operating against a head of 38 to 19 feet respectively, at 1750 RPM. Ask for Bulletin 279.

Lapp CHEMICAL PORCELAIN VALVES

• Thousands upon thousands of Lapp Porcelain Valves are now giving completely satisfactory service in installations where demands for purity or corrosion-resistance had never before satisfactorily been met. Sound and simple in design, Lapp valves provide solid porcelain in all parts which come in contact with liquids. Their cost is but a fraction that of expensive alloy or lined valves. Available are porcelain valves in standard Y and angle pattern, Y and angle pattern in *new* armored construction, safety blow-off valves, flush valves, and straightway and three-way plug cocks. Ask for Bulletin 244.

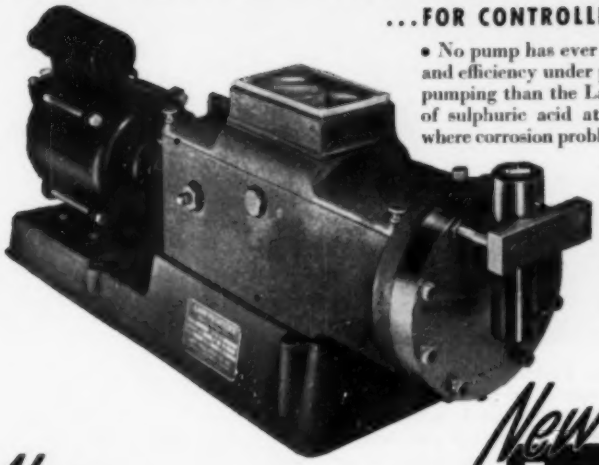


BOOTH NO. 441-442
22nd EXPOSITION
of Chemical Industries
November 28 - December 3

Lapp

Lapp PULSAFEEDER

PISTON-DIAPHRAGM CHEMICAL PROPORTIONING PUMPS



...FOR CONTROLLED VOLUME PUMPING OF FLUIDS

• No pump has ever been built which offers greater dependability and efficiency under production requirements for metered pressure pumping than the Lapp Pulsafeeder. Try it for metered pumping of sulphuric acid at *any* concentration—or for any application where corrosion problems, purity, or accurate proportioning impose a severe pumping problem.

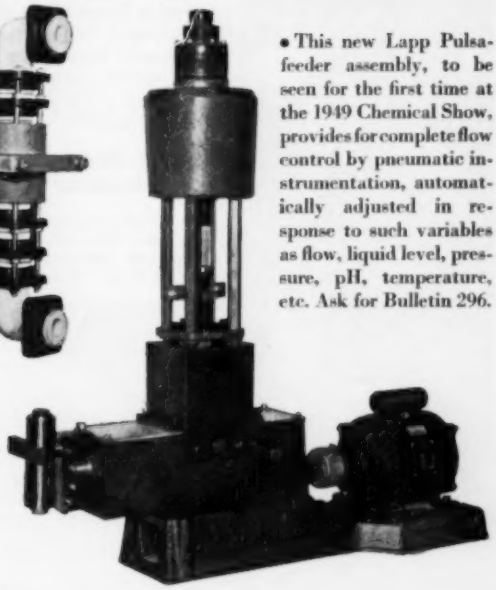
- **NO STUFFING BOX OR RUNNING SEAL**
- **HYDRAULICALLY-BALANCED DIAPHRAGM SEAL**
- **POSITIVE-DISPLACEMENT PISTON MEASUREMENT**
- **FLOW-RATE ADJUSTABLE WHILE IN OPERATION**
- **OIL-BATH LUBRICATION OF ALL MOVING PARTS**

Ask for Bulletin 262.

New Lapp NON-METALLIC LIQUID-END PULSAFEEDER

• Now the Lapp Pulsafeeder is available in a model which completely eliminates metal in any part which comes in contact with fluid being pumped. Reagent-head, valves and valve housing are armor-encased solid porcelain. Valve seats are Teflon; diaphragm is Kel-F. Ask for Bulletin 295.

New Lapp AUTO-PNEU-MATIC PULSAFEEDER

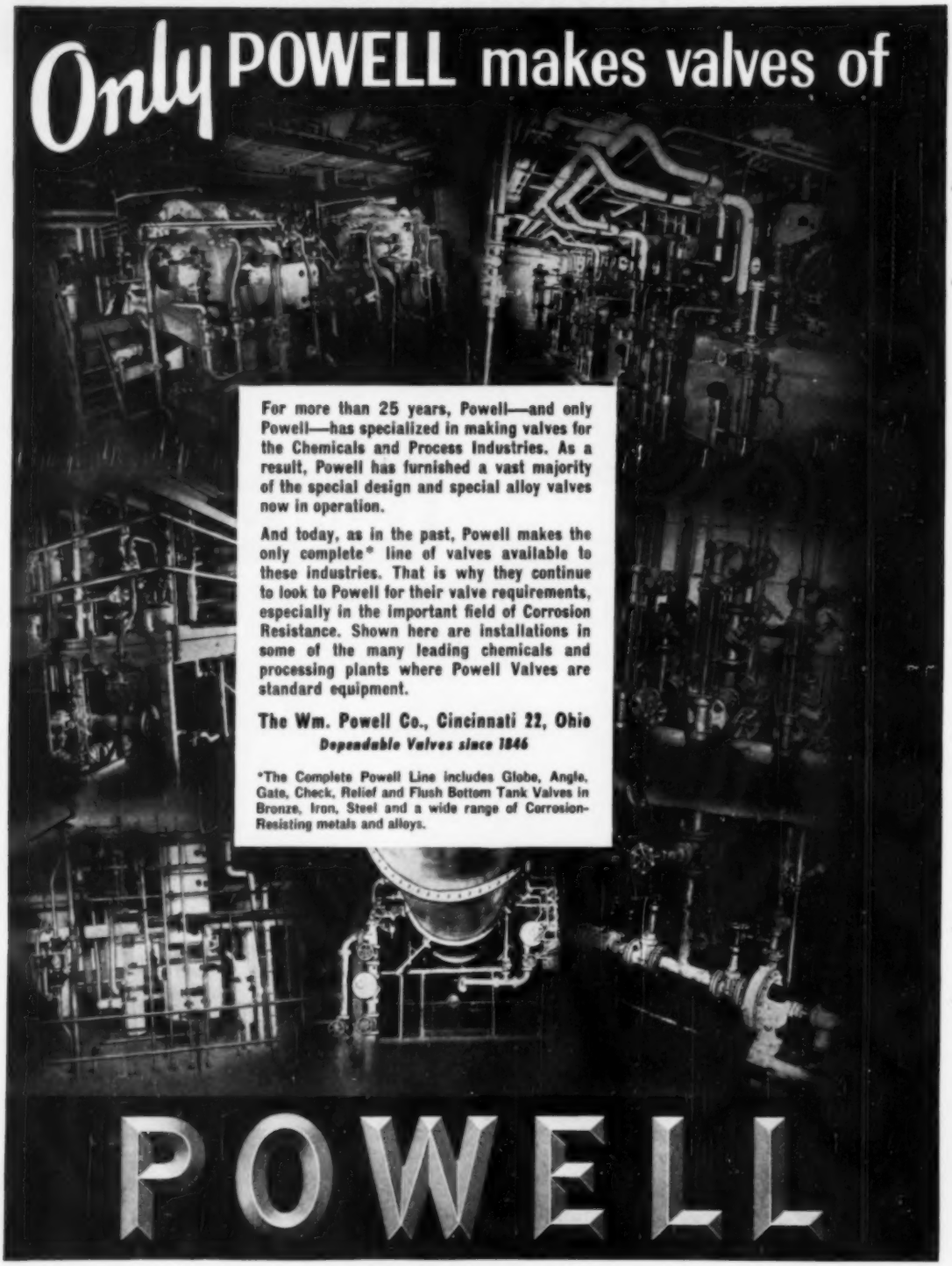


• This new Lapp Pulsafeeder assembly, to be seen for the first time at the 1949 Chemical Show, provides for complete flow control by pneumatic instrumentation, automatically adjusted in response to such variables as flow, liquid level, pressure, pH, temperature, etc. Ask for Bulletin 296.

Process Equipment

...LAPP INSULATOR COMPANY, INC., LE ROY, NEW YORK

Only POWELL makes valves of



For more than 25 years, Powell—and only Powell—has specialized in making valves for the Chemicals and Process Industries. As a result, Powell has furnished a vast majority of the special design and special alloy valves now in operation.

And today, as in the past, Powell makes the only complete* line of valves available to these industries. That is why they continue to look to Powell for their valve requirements, especially in the important field of Corrosion Resistance. Shown here are installations in some of the many leading chemicals and processing plants where Powell Valves are standard equipment.

The Wm. Powell Co., Cincinnati 22, Ohio

Dependable Valves since 1846

*The Complete Powell Line includes Globe, Angle, Gate, Check, Relief and Flush Bottom Tank Valves in Bronze, Iron, Steel and a wide range of Corrosion-Resisting metals and alloys.

POWELL

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ALL the materials needed in the Chemicals and Process Industries

Fig. 2453-G—Large 150-pound Stainless Steel O. S. & Y Gate Valve.

Fig. 1969-M—150-pound Monel Metal* O. S. & Y Gate Valve.

Fig. 1854—100-pound Aluminum Globe Valve with composition disc.

Fig. 2327 — Stainless Steel Angle Relief Valve with enclosed spring.

Fig. 1891 — Flanged End Liquid Level Gauge. Offset Pattern.

Fig. 1832-AMP—200-pound Ampco‡ Gate Valve.

THESE ARE A FEW OF THE MANY POWELL VALVES YOU WILL SEE AT OUR

BOOTH 54

22nd Exposition of Chemical Industries
Grand Central Palace, New York City
November 28 to December 3

Flush Bottom Tank Valve. Available in two designs. Fig. 2309—disc rises into tank to open; Fig. 2310—disc lowers into body.

Fig. 1978-NI—150-pound Nickel O. S. & Y Globe Valve

Fig. 1861-IN—150-pound Inconel* Globe Valve.

Bellows Sealed "Y" Valve. Designed for high vacuum service and for installations where packing is unsatisfactory or fails frequently.

Fig. 2097—Stainless Steel Glass Sight Feed.

Fig. 1845—200-pound Nickel Swing Check Valve.

Fig. 2051 S. W.—150-pound Stainless Steel "Y" Valve with Powell Patented Seat Wiper.

Fig. 1095 HA—300-pound Hastelloy† Separable Body, Reversible Seat "Y" Valve.

Fig. 1893—125-pound Nickel-Iron O. S. & Y. Gate Valve with trim specially adapted for Paper Mill service.

POWELL VALVES for Corrosion Resistance are available in the following Metals and Alloys.

Stainless Alloys
18-8S
18-8S Mo.
18-8S Cb.
Misco "C"
Durimet 20
11.5-13.5% Cr. Iron
18% Cr. Iron
28% Cr. Iron
25% Cr. 12% Ni.

Nickel and Nickel Alloys
Nickel
Monel Metal*
Inconel*
Hastelloy Alloys† (A, B, C and D)
Illium
D-10

Bronzes—Acid, Aluminum, Silicon
Everdur
Herculoy
Ampco‡
Ampcoloy‡
76
90-10
88-10-2

Alloy Steels
Carbon Steel
4-6% Cr. .5% Mo.
3½% Nickel Steel
6-8% Cr. Mo.
8-10% Cr. Mo.

Cast Irons
Cast Iron
3% Nickel Iron
Ni-resist*

Aluminum
Alcoa No. 43
Alcoa No. B-214
Alcoa No. 61 S-T

Silver

Hard Lead

Molybdenum

*Registered trade names of the International Nickel Co., Inc.
†Registered trade-name of the Haynes-Stellite Co.
‡Registered trade-name of Ampco Metal, Inc.

VALVES

Guide & Directory Page 85

See the new . . .

SPARKLER FILTERS

at the Chemical Show
Booth No. 516 & 517

NEW Flush-off type filter designed to permit quick and easy flushing-off of plates with a minimum of interruption in service. Especially adapted for use where a heavy deposit of residue requires frequent cleaning of filter plates during a production run.

All Sparkler Filters have the exclusive QUICK CHANGE feature whereby the entire plate assembly can be removed as a unit for cleaning. A reserve plate assembly unit can be immediately lowered into the tank and filtering resumed with a minimum of interruption in service. The horizontal position of the plates eliminates the danger of cracking or slipping of the cake under variations in pressure or intermittent operation.

Sparkler filters take up little floor space, are completely enclosed, and are available in stainless steel, mild steel, rubber lined, steam jacketed or brine jacketed, monel, nickel, or bronze. They efficiently handle practically any kind of liquid from thin volatile fluids to heavy bodied material.

Stop in at the Sparkler booth and get complete information on our latest developments in filtration engineering.

SPARKLER horizontal plate FILTERS

SPARKLER MANUFACTURING CO. MUNDELEIN, ILLINOIS

Guide & Directory Page 88

with This NEW All-Electric BULK AND BAGGING SCALE

Speed up your processing cycle by the fast, smooth operation of this new Richardson Model E-50 Scale. Whatever the batch, the new E-50 enables you to maintain *exact* control over the proportions of each ingredient and protects the uniformity of your end product.

Operate It Yourself!

Step into Booth 659-660 and see this scale in action. It represents Richardson's latest achievement in automatic weighing equipment for the chemical and process industries. Examine it . . . operate it yourself from the Control Panel. Note how quickly you can change time sequences of discharges, how individual weighings are counted and automatically recorded. See how accurate "en masse" weighings can be ironed out into a perfect stream; note the visual, sensitive indicator for accuracy of weighings.

Remember . . . . **BOOTH NO. 659-660**

7325

The Exposition of Chemical Industries
Nov. 28-Dec. 3—Grand Central Palace, New York City

RICHARDSON SCALE COMPANY
CLIFTON, N. J.
Atlanta • Boston • Buffalo
Chicago • Minneapolis • Wichita
New York • Omaha • Philadelphia
Pittsburgh • San Francisco
Montreal • Toronto

Guide & Directory Page 87

Get the facts in New York!

You are cordially invited to visit Booth Nos. 460-461
at the Chemical Industries Exposition, Nov. 28 to Dec. 3
to inspect the latest developments in
Roto-Clone Dust Control Equipment and Cycoil Air Cleaners

AMERICAN AIR FILTER COMPANY, INC.
326 Central Avenue, Louisville 8, Ky.
In Canada: Darling Bros., Ltd., Montreal, P. Q.

On display for your inspection will be . . .

TYPE N ROTO-CLONE

A Hydro-Static Precipitator in which dust is separated from the air by means of a water curtain. Combined washing and scrubbing action results in high efficiencies with all types of dust. Available in capacities from 750 to 45000 CFM.

TYPE D ROTO-CLONE

A Dynamic Dust Precipitator combining the functions of exhauster, dry dust separator and dust storage hopper in a simple, compact, self-contained unit. Available in capacities from 200 to 15000 CFM.

CYCOIL OIL BATH CLEANER

A heavy-duty air cleaner designed for compressor and engine service. Cycoil provides 4-way cleaning—impingement, scrubbing, cyclonic action and filtering—to deliver practically 100% dust removal in addition to serving as an intake silencer.

AAF

ROTO-CLONE® DUST CONTROL EQUIPMENT

Guide & Directory Page 88

if you use phenolics....

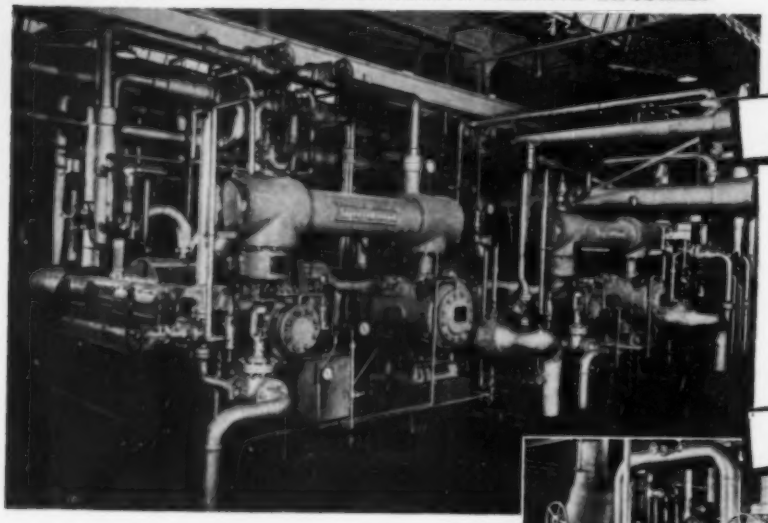
cut resin costs 15-20%

"Vinsol" Resin Emulsions and Solutions

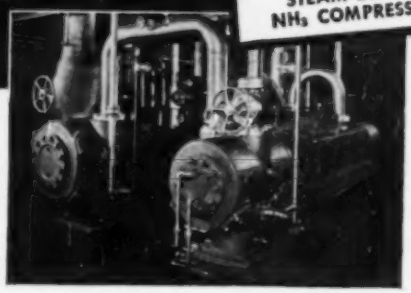
One of the lowest priced, most plentiful dark resins obtainable today, "Vinsol" is saving money for many manufacturers—as a modifier, extender, or partial replacement for phenolics. A 15-20% reduction in total resin costs is common—with no appreciable sacrifice in physical or chemical properties. "Vinsol" is available as a solid resin and in emulsion or solution form for use with water-soluble or spirit-soluble phenolics. We welcome the opportunity to work with you on possible applications. Write for technical details, samples, prices.

HOW CREATIVE CHEMISTRY HELPS THE PROCESS INDUSTRIES

HERCULES POWDER COMPANY INCORPORATED 952 Market Street, Wilmington 99, Delaware



STEAM-DRIVEN CO_2 COMPRESSORS



STEAM-DRIVEN NH_3 COMPRESSOR

At New "DRY-ICE" Plant

PURE CARBONIC
INCORPORATED

Depends on IR COMPRESSORS

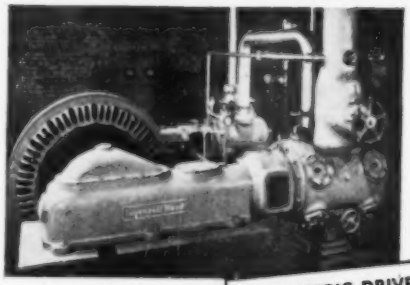
Seven Ingersoll-Rand compressors totalling 1450 hp, in the new Chicago carbon-dioxide plant of Pure Carbonic, Incorporated, help produce 150 tons of "DRY-ICE" daily... for food industries and manufacturers of resins, paints, rubber, plastics, ceramics, pharmaceuticals, petroleum products, and fire extinguishers.

Four 200-hp compressors handle CO_2 gas, compressing it from 35 to 360 psi. These are the well-known Ingersoll-Rand Type XPV steam-engine-driven compressors noted for their simplicity, adaptability to varying conditions, economy, and smooth operation in process service.

One of the ammonia-refrigeration compressors is of the same steam-driven type. The other two, 150 hp each, are of heavy-duty, double-acting, synchronous-motor-driven design.

During the 40 years it has been producing carbon dioxide, Pure Carbonic, Incorporated, has installed Ingersoll-Rand compressors in several of its other plants.

Ingersoll-Rand has had long experience in designing and building process compressors for practically all pressures and all kinds of gases in sizes up to 3000 hp. Qualified compressor specialists are located in I-R offices all over the world. Call upon this experience when you need help in solving a problem of air or gas compression.



ELECTRIC-DRIVEN NH_3 COMPRESSOR

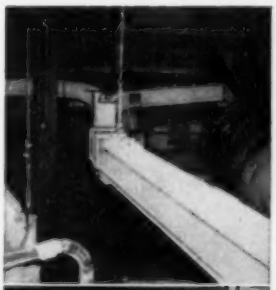
Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y. 457-1

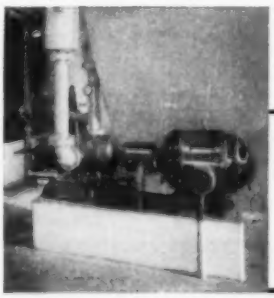
COMPRESSORS · AIR TOOLS · ROCK DRILLS · TURBO BLOWERS · CONDENSERS · CENTRIFUGAL PUMPS · OIL AND GAS ENGINES

VISIT WITH US . . . BOOTHS 315-317 . . . ON THE MEZZANINE . . . 46TH STREET SIDE OF THE BUILDING

As in previous years, it will again be a pleasure to welcome you in our booths at the Chemical Show . . . to talk over your problems on conveying, feeding, and cooling of dry pulverized and granular materials; also your requirements on air compressors and vacuum pumps. Sales engineers will be in attendance to discuss any problems you may have, and on which we might be of assistance to you.



G-60



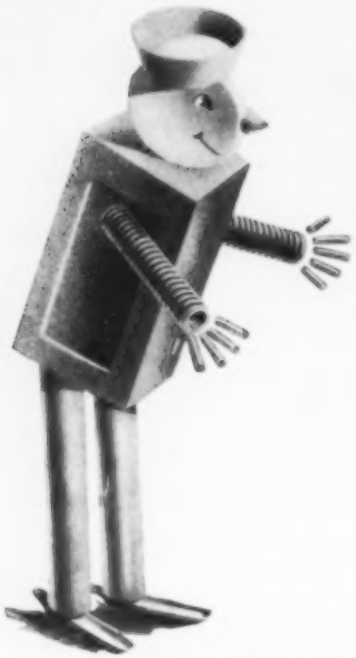
FULLER COMPANY

CATASAUQUA, PENNSYLVANIA

Chicago 3 - 120 So. LaSalle St.

San Francisco 4 - 420 Chancery Bldg.

FULLER-KINYON, FULLER-FLUXO, AIRVEYOR, F-H AIR-SLIDE CONVEYING SYSTEMS . . . ROTARY FEEDERS AND VALVES . . . ROTARY COMPRESSORS AND VACUUM PUMPS . . . INCLINED-GRATE COOLER . . . DRY PULVERIZED-MATERIAL COOLER . . . MATERIAL-LEVEL INDICATOR . . . AERATION UNITS . . . AIRLIFT . . . CONSTANT-HEAD FEEDER SLURRY VALVES . . . . MOTION SAFETY SWITCH . . . SAMPLERS



Norton Company
Booth 415-416
The Chemical Show
Grand Central Palace
Nov. 28 to Dec. 3

HEAT EXCHANGE PELLETS AND CATALYST SUPPORTS. These products will be on display in Norton Company Booth 415–416 at the Chemical Show and we invite you to visit our exhibit and talk with our engineers about these products. Heat exchange mediums in the form of perfectly round spheres having a diameter of approximately .35″ are manufactured for use in pebble heater furnaces. In addition to their excellent heat transfer properties, these spheres have great physical strength. In tests they have been dropped seven stories onto a cast-iron plate without breaking. They are therefore able to withstand any load placed upon them in the furnace. Norton Company is also manufacturing a variety of catalysts and catalyst supports on an experimental basis. The supports are made from different mixtures of fused alpha alumina. Catalysts are nickel-oxide types. Both catalysts and supports are available in sphere, pellet and ring forms.

If you would like a technical bulletin giving more information on these and other Norton high temperature refractories, write for our free bulletin No. 151.

NORTON
REFRACTORIES

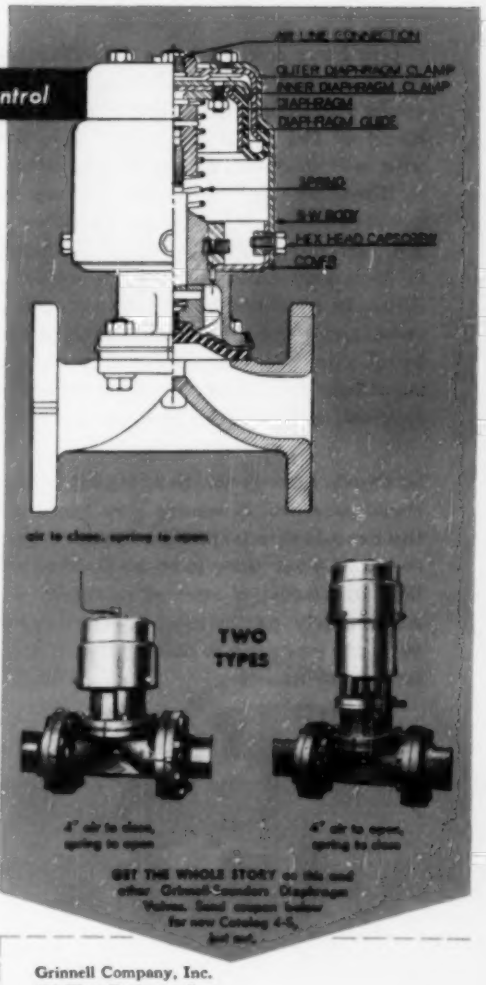
NORTON COMPANY, WORCESTER 6, MASS.

Making Better Products to Make Other Products Better

22nd EXPOSITION CHEMICAL INDUSTRIES BOOTH 251

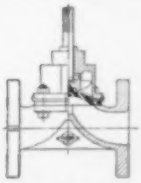
NEW! Grinnell-Saunders Diaphragm Valves *power operated* by Bendix-Westinghouse Rotochambers

dependable power operation and remote control


AIR LINE CONNECTION
OUTER DIAPHRAGM CLAMP
INNER DIAPHRAGM CLAMP
DIAPHRAGM
DIAPHRAGM GUIDE
BONNET
BODY
HEX HEAD CAP SCREW
COVER
air to close, spring to open
TWO TYPES
4" air to close, spring to open
4" air to open, spring to close
GET THE WHOLE STORY on this and other Grinnell-Saunders Diaphragm Valves. Send coupon below for new Catalog 4-S, just out.

FEATURES:

- Bendix-Westinghouse Rotochamber top-works has rolling sleeve type of seal . . . leakproof and practically frictionless. No packing glands and no lubrication required.
- Pressed steel cylinder is neat looking, light and compact. Height of 2" flanged air-to-close valve from center line to top is only 9¾"; air-to-open valve (in open position) is 14⅛".
- Bendix-Westinghouse top-works has been tested up to seven million strokes without any sign of wear or failure.
- Top-works may be operated with air or hydraulic pressures up to 105 pounds. For pressures up to 100 pounds in the line being controlled, an actuating pressure of only 50 pounds is required under average conditions. Pressure reducing valves are not required for pressures up to 105 pounds because of adjustable stem travel stops incorporated in the valve bonnet design.
- Adjustment is easily made without removal of top-works from valve body.



Sliding stem bonnet assembly is suitable for use with other valve motor units. Sliding stem bonnets are interchangeable with other bonnet designs.

YOU GET THESE ADVANTAGES IN ANY GRINNELL-SAUNDERS DIAPHRAGM VALVE: Diaphragm isolates working parts from the fluid, preventing corrosion of these parts and contamination of the fluid; diaphragm opens wide for streamlined flow; diaphragm presses tight for positive closure, even with suspended solids in the line; body, lining and diaphragm materials to meet service conditions; simple maintenance.

Visit us at booth 251, Chemical Show
Grand Central Palace, New York, November 28 to December 3

Grinnell Company, Inc.
273 West Exchange St.
Providence 1, R. I.

Please send me a copy of your new Catalog 4-S of Grinnell-Saunders Diaphragm Valves.

Name _____

Company _____

Address _____

_____

90 YEARS PIPING

GRINNELL

The *OUTSTANDING FILTER

*Outstanding because of:

(1) its proved success

(2) its versatility

(3) its great capacity

(4) its washing efficiency

(5) its viability

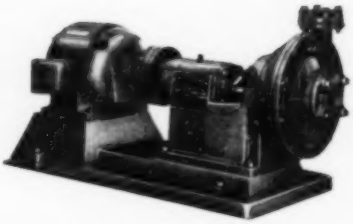
If you have a filtration or clarification problem or need shortly to replace some filters, where else could you better call than at Booth 66, right at the head of the main stairway, first floor? For here you will find an exceptionally broad experience in filtration, one that covers *every* division of the process industry requiring filtration . . . Here you will find many types of filters from which to select. In fact, only Oliver United can offer selection from filters in all three basic types: continuous vacuum, continuous pressure, and batch pressure . . . And here, you will find testing, research and development facilities unequaled anywhere in the industry to work with you on your problems.

In short, Oliver United, rightly called Filtration Headquarters, is where you have at your service the broadest in experience and the widest in selectivity. If your time is to be limited and you would like to discuss a special problem with engineers particularly experienced along those lines, write us when you plan to call and we'll have the specialists at our booth.

. . . and this particular filter—a 3 foot, stainless steel unit—can be purchased at the show for delivery the following week, *first come first served.*

OLIVER HORIZONTAL

a reminder: We also make a line of OLIVITE Acid-Handling Pumps and Oliver Diaphragm Slurry Pumps. So, if you have any pumping problems involving chemicals or slurries, make it a point to discuss these, too.



at the Chemical Show!

ROTARY FILTER

UF INC.

OLIVER UNITED FILTERS INC.

New York 18, N. Y.
33 West 42nd Street

Chicago 1, Ill.
221 N. LaSalle Street

San Francisco 11, California
Western Sales Division: Oakland 1, Calif.—2900 Glascock Street

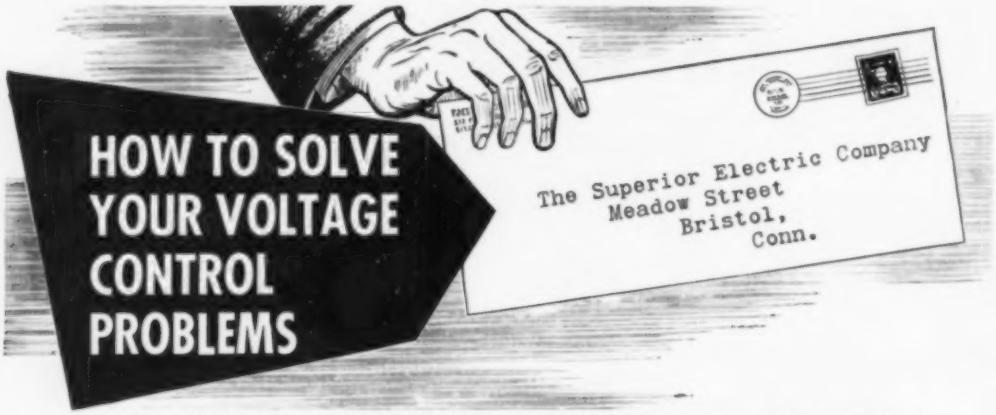
Salva-Separator Corporation
S. Lee, Mass.

Oliver United Filters (Canada) Limited
Orillia, Ontario, Canada

Patterson Oakland, Calif.

Hazleton, Pa. • Orillia, Canada • Southbourne, England

Booth 60 New York Chemical Show, where you can see the Oliver Horizontal Rotary Filter



HOW TO SOLVE YOUR VOLTAGE CONTROL PROBLEMS

Every day we help someone solve their voltage control difficulties — someone who has written or called us, given us the details of their problem and asked us to recommend a solution. Because we're known as manufacturers of superior voltage control equipment, engineers rely on our judgment — and on our voltage control equipment. Next time you have a problem, we'll be glad to work with you on it. The following are examples of just a few units which have led to a quick solution for others.

HAND-OPERATED FOR MANUAL CONTROL

These POWERSTAT Variable Transformers give you a variable output voltage from a-c lines. They're suitable for 115, 230, 440 volt, single and polyphase duty, 25, 50/60 or 400/800 cycles; in ratings from 400VA to 75KVA.

POWERSTAT Line Correctors, below, are best used to hold a varying line to a nominal value, or to vary a constant line voltage over a limited range at large current capacities. Numerous models are offered, in capacities up to 100KVA.

MOTOR-DRIVEN FOR PUSHBUTTON CONTROL

Available in the same wide range of capacities as manually-operated units. Recommended for remote pushbutton or automatic controller operation. Special 3-wire synchronous motor drives the POWERSTAT Variable Transformer. By using appropriate gearing combinations

various speeds of travel from zero to maximum output can be had to suit each need. Motor operates from a 115V single phase source max. current requirement is 0.4A. Rotor shaft is ball-bearing mounted for long, quiet operation. Rapid starting and instantaneous stopping are features.

ELECTROMECHANICAL OR INSTANTANEOUS

STABILINE Automatic Voltage Regulators maintain a constant output voltage, regardless of variations in input voltage or load current; require no attention for continuous operation. Type EM (Electro-mechanical), above, is recommended where long-term stability for 24-hour line correction is required. Type IE (Instantaneous Electronic), below, performs electronically, instantaneously. Line stabilization is 0.1%; regulation is 0.15%. Waveform distortion *never* exceeds 3%.

WRITE TODAY FOR BULLETIN 547
The Full SECO Line
2119 MEADOW STREET

THE SUPERIOR ELECTRIC CO.
BRISTOL, CONNECTICUT

POWERSTAT VARIABLE TRANSFORMERS • VOLTBOX A-C POWER SUPPLIES • STABILINE VOLTAGE REGULATORS

For ALUMINUM
that gives you more and can cost you less . . .

THERE ARE many reasons why it's to your advantage to look to us for all your aluminum needs. Here are a few of them:

1. You get Reynolds Lifetime aluminum that's guaranteed as to uniformity of size and thickness; of alloy, temper, and other physical characteristics.
2. You know that you are obtaining your aluminum from a well-known, dependable source.
3. You have the assurance that your aluminum will be packaged carefully. Thus, the contents will arrive undamaged—without water stains, bending of material, injury to corners, or surface scratches.
4. You have the additional valuable advantage of our metallurgical advice and assistance in problems of application.

And, what's very important, we can show you how it can cost you less when you place your orders for aluminum with us. So, whenever you need aluminum, remember that your best source of supply is United States Steel Supply. For prompt, courteous service, just phone, wire or write the warehouse or sales office nearest you.

UNITED STATES STEEL SUPPLY COMPANY · USS STEELS · SERVICE

SYMBOL OF SERVICE

UNITED STATES STEEL SUPPLY COMPANY

Warehouses: BALTIMORE · BOSTON · CHICAGO
CLEVELAND · LOS ANGELES · MILWAUKEE · MOLINE, ILL. · NEWARK · PITTSBURGH
PORTLAND, ORE. · SAN FRANCISCO · SEATTLE · ST. LOUIS · TWIN CITY (ST. PAUL)
Also Sales Offices at: KANSAS CITY, MO. · PHILADELPHIA · TOLEDO · TULSA · YOUNGSTOWN
Headquarters Offices: 208 S. La Salle St.—Chicago 4, Ill.

USS

UNITED STATES STEEL

It's the Nash!

There are no mechanical complications in a Nash Compressor. A single moving element, a round rotor, with shrouded blades, forming a series of buckets, revolves freely in an elliptical casing containing any low viscosity liquid. This liquid, carried with the rotor, follows the elliptical contour of the casing.

The moving liquid therefore recedes from the rotor buckets at the wide part of the ellipse, permitting the buckets to fill with gas from the stationary Inlet Ports. As the casing narrows, the liquid is forced back into the rotor buckets, compressing the gas, and delivering it through the fixed Outlet Ports.

Nash Compressors produce 75 lbs. pressure in a single stage, with capacities to 6 million cu. ft. per day in a single structure. Since compression is secured by an entirely different principle, gas pumping problems difficult with ordinary pumps are often handled easily in a Nash.

Nash simplicity means low maintenance cost, with original pump performance constant over long periods. Data on these pumps sent immediately on request.

No internal wearing parts.

No valves, pistons, or vanes.

No internal lubrication.

Low maintenance cost.

Saves floor space.

Desired delivery temperature automatically maintained.

Slugs of liquid entering pump will do no harm.

75 pounds in a single stage.

NASH ENGINEERING COMPANY
325 WILSON, SO. NORWALK, CONN.

CUT MAINTENANCE COSTS
with permanent insulation

This photo shows how PC Foamglas is used to insulate tanks and pipe lines. The material is available in standard flat blocks, curved segments and beveled lags to fit equipment sides, heads and domes, and in preformed sections for standard pipe sizes and fittings.

● It takes a mighty effective insulating material to maintain the precise temperature controls demanded by your processing operations. And it takes a mighty trouble-free material to keep your maintenance costs down to rock bottom.

PC Foamglas has long since proved its ability to maintain high or low temperatures, indoors and out. It has met all tests successfully . . . on tanks, towers, retorts and other large vessels . . . on piping and fittings . . . on heat exchangers, evaporators and other processing equipment . . . in a wide range of industries.

And PC Foamglas needs no costly maintenance, repairs or replacements. It is moistureproof, fireproof, acidproof. When installed according to our specifications and recommendations, PC Foamglas retains its original insulating efficiency *permanently*.

Our insulating specialists will be glad to consult with you upon request, to find out just how you can save money on maintenance with PC Foamglas. Meanwhile, why not send the coupon for our new booklet about typical uses of Foamglas and a sample of the material—today?

This is FOAMGLAS®

The entire strong, rigid block is composed of millions of sealed glass bubbles. They form a continuous structure, so no air, moisture, vapor or fumes can get into or through the Foamglas block. In those closed glass cells, which contain still air, lies the secret of the material's permanent insulating efficiency.

For additional information see our inserts in Sweet's Catalogs

SEE OUR EXHIBIT at the 22nd Exposition of Chemical Industries, Grand Central Palace, November 28 to December 3, Booth #643.

Pittsburgh Corning Corporation
Dept. R-119, 307 Fourth Avenue
Pittsburgh 22, Pa.

Without obligation on my part, please send me a free sample of Foamglas and your FREE booklet on PC Foamglas—The permanent industrial insulation.

Name.....

Address.....

City.....State.....

PITTSBURGH PC CORNING

FOAMGLAS INSULATION

. . . when you insulate with FOAMGLAS . . . you insulate for good!

Here's a Good Tip...

INTER OFFICE MEMO

FROM: J.E.P.

TO: Personnel Attending Chemical Show
New York, Nov. 28 - Dec. 3

Suggest you contact representatives in Booth 554-555 (National Engineering Company of Chicago) -- get their ideas on cutting costs over our present Mixing methods. Be sure to check on the latest developments in Simpson Intensive Mixers and handling equipment for lab, pilot plant and straight production work.

J.E.P.

• National Engineering Company will have competent engineers on hand to answer any questions you may have relative to chemical process mixing requirements. Actual *working* equipment will be on display to demonstrate the proven advantages of the Simpson Method of *Controlled Mixing* . . . and how it will effect a better, faster blending job for you at lower cost.

National Engineering Company

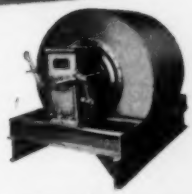
Machinery Hall Bldg. • Chicago 6, Illinois

Manufacturers and Selling Agents for Continental European Countries—The George Fischer Steel & Iron Works, Schaffhausen, Switzerland. For the British Possessions, Excluding Canada and Australia—August's Limited, Halifax, England. For Canada—Dominion Engineering Co., Ltd., Montreal, Canada. For Australia and New Zealand—Gibson, Battle & Co., Pty., Ltd., Sydney, Australia.

You Can Cut Today's High Production Costs with STURTEVANT EQUIPMENT

AIR SEPARATOR

For separation of fines to 325 mesh and finer. Increases output from 25% to 300% . . . lowers power costs by 50%. For years, this separator has been the standard in the cement industry.



DUSTLESS BLENDER

Four-way mixing action assures a thoroughly blended product. Open-door accessibility permits easy cleaning. Available in many mixing capacities for ¼ ton per hour and up.

RING-ROLL MILLS

For medium and fine reduction (10 to 200 mesh), hard or soft materials. Very durable, small power. Operate in closed circuit with Screen or Air Separator. Open-door accessibility. Many sizes. No scrapers, plows, pushers, or shields.

SWING-SLEDGE MILLS

For coarse and medium reduction (1" to 20 mesh). Open-door accessibility. Soft, moderately hard, tough or fibrous substances. Built in several types and many sizes.

JAW CRUSHERS

For coarse, intermediate and fine reduction of hard or soft substances. Heavy or light duty. Cam and Roller action. Special crushers for Ferro-alloys. Several types, many sizes.

Sturtevant equipment, such as illustrated, helps you overcome high labor and production costs by increasing output. In addition, their rugged construction assures long life with minimum maintenance. It will pay you to investigate these machines. Write for information.

STURTEVANT MILL COMPANY
100-A CLAYTON STREET, BOSTON 24, MASSACHUSETTS

Designers and Manufacturers of: CRUSHERS • GRINDERS • SEPARATORS
CONVEYORS • MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS

MAIL COUPON TODAY!

STURTEVANT MILL COMPANY
100-A Clayton Street, Boston 24, Mass.

Gentlemen:
Please send me your catalog. I am especially interested in _____

Name _____

Street _____

City & State _____

It's TRI-CLOVER for ALL your CORROSION

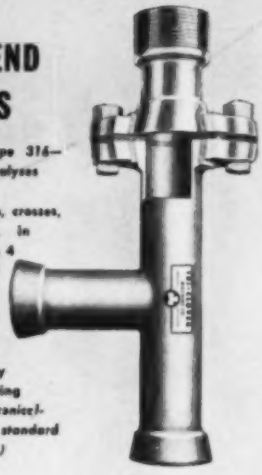
"ZEPHYRWELD"* WELDING FITTINGS

. . . *Stainless Steel Type 304, 347 and 316—Inconel and other 55 analyses*

Fabricated in I.P.S. and O.D. Tube Size from ⅛ in. thru 24 in. —in ells, tees, crosses, welding nipples, flanges, adapters, etc. Features: Streamlined, sweep all construction; free-flow; light weight, fully annealed and passivated. Widly used in broad chemical process use.

*Trade Mark Registered

CONICAL END FITTINGS



. . . *Stainless Steel Type 316—Inconel and other 55 analyses*

Complete line of ells, tees, crosses, laterals, reducers, etc., in sizes from 1 in. O.D. thru 4 in. O.D. Features: Light weight—low cost—simple, fast installation—leak-tight — sturdy flanges of all types for every application — easily adapted to all other fitting types. *(View shows conical-end tee flanged to standard I. P. S. threaded adapter.)*

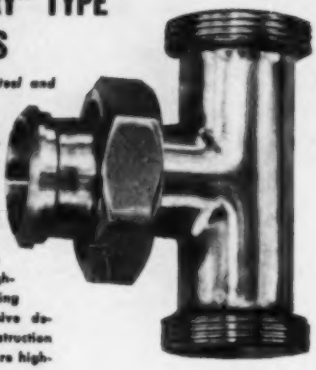
RECESSED-END FITTINGS

. . . *Stainless Steel Type 304-347-316*

Low cost, light weight fittings designed for fast, simple soldering, brazing or socket welding, in sizes from ⅛ in. thru 24 in. Full line of elbows, return bends, tees, crosses, adapters, etc.

"SANITARY" TYPE FITTINGS

. . . *Stainless Steel and Tri-Alloy**



Sizes from 1 in. thru 4 in. O.D., in full range of fitting types. Designated and approved as meeting 3 A Standards throughout, incorporating numerous exclusive design and construction feature that assure highest quality.

*(Nickel Alloy)

Stocks of Standard Fitting Types Strategically Located Throughout the Country

Tri-Clover MACHINE CO.
Kenosha, Wisconsin

TRIALLOY AND STAINLESS STEEL SANITARY FITTINGS, VALVES, PUMPS, TUBING, SPECIALTIES

THE Complete LINE

FABRICATED STAINLESS STEEL INDUSTRIAL FITTINGS AND INDUSTRIAL PUMPS

See these fittings in BOOTH 498
at the New York CHEMICAL EXPOSITION
. . . for faster action — CALL-WIRE
or CLIP THE COUPON NOW . . .

RESISTANT *piping problems!*

FLANGED and SCREWED FITTINGS and VALVES

. . . *Stainless Steel Type 304-347-316*

Complete range of fitting types. This quality line meets the demand wherever flanged and screwed fittings and liquid lines are required. Clean-cut, accurate threads match standard I.P.S. piping.

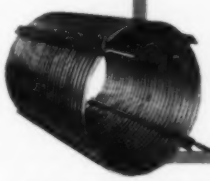
SPECIALIZED MANUFACTURING FACILITIES

Standard butt-welded fittings furnished in flanged assemblies. By using standard Tri-Clover fittings, we can often solve many "special" problems with a minimum of extra fabrication.

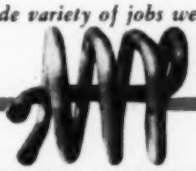
Prefabricated evaporating coil assembly built to exact specifications.

Special welded tubing and shapes fabricated from several stainless steel types.

When it comes to expert welding and fabricating of complex assemblies, you just can't beat the speed and accuracy offered with TRI-CLOVER'S exclusive Heli-Arc Atomic Hydrogen Welding . . . a specialized semi-automatic process that assures highest quality and FULL corrosion resistance. *Shown here are a few typical examples of the wide variety of jobs we handle every day.*



Stainless Steel coils of every size and description to meet your specific requirements.



Tri-Clover Industrial Centrifugal Pumps — for every corrosion problem — complete range of capacities up to 1250 GPM and up to 250 ft. head.

• COMPLETE ANNEALING FACILITIES •

To: TRI-CLOVER MACHINE CO., Kenosha 1, Wisconsin

Send me more information on the following:

- ☐ ZEPHYRWELD Welding Fittings
- ☐ CONICAL END Fittings
- ☐ RECESSED-END Fittings
- ☐ "SANITARY" Type Fittings
- ☐ SCREWED Fittings and Valves
- ☐ PUMPS
- ☐ PIPE and TUBING
- ☐ Custom fabrication of.....(type of unit)

Name.....Title.....

Company.....

Address.....

City.....Zone.....State.....

BOOTH 625 22nd EXPOSITION CHEMICAL INDUSTRIES

Announcing New GOULDS

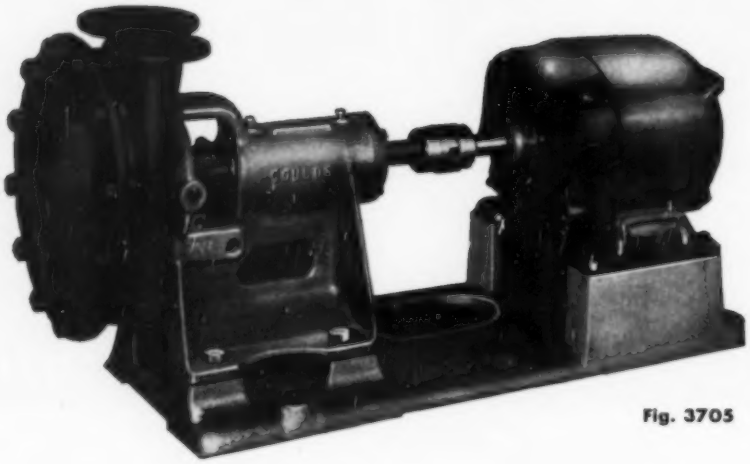


Fig. 3705

Outstanding service in handling corrosive liquids— *Goulds Stainless Steel Centrifugals*

Goulds Fig. 3705 Stainless Steel Centrifugals represent the last word in advanced pump design. Goulds Pumps, Inc., pump specialists for over 100 years, developed these pumps to give efficient, dependable service in the handling of corrosive liquids—at low cost.

Capacities up to 750 G.P.M.

Goulds stainless centrifugals are made in 8 sizes to cover all the usual requirements encountered in the process and other industries for handling corrosive liquids. Capacities range up to 750 G.P.M. with heads up to 180 ft., depending on capacity.

See this pump on display at our exhibit at the 22nd Exposition Chemical Industries, Grand Central Palace, New York, from November 28th to December 3rd. Booth 625.

Built for tough service

Goulds new stainless steel centrifugals are as simple as engineering ingenuity can make them. Every part that goes into these pumps is rugged enough to give you a large safety factor and long life—but there has been no wastefulness of expensive metals.

When you see the performance curves you will see that efficiency is high.

These stainless steel pumps are built for tough, twenty-four-hour service under the most exacting conditions.

MAIL COUPON FOR *FREE* COPY OF BULLETIN 725.3 GIVING COMPLETE DETAILS ON GOULDS STAINLESS STEEL PUMPS

Stainless Steel Pumps...

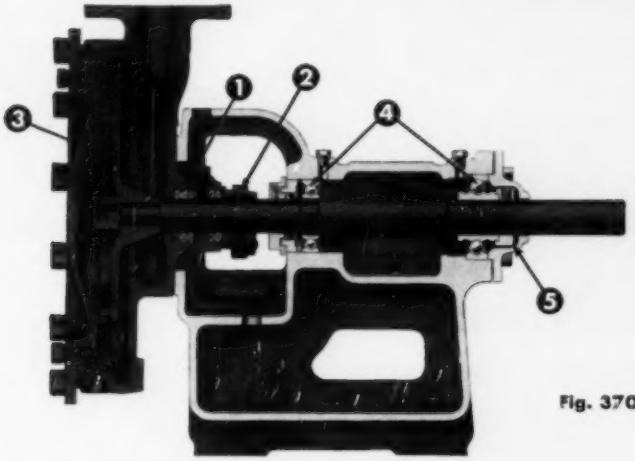


Fig. 3705

Outstanding economy in design and performance

Check these design features

1. Stuffing box under suction pressure only—This assures long packing life and freedom from excessive leakage.
2. Cowl type stuffing box gland split on 45° angle —Easy to disassemble. Single and double mechanical seals also available.
3. Piping connections in casing—You can inspect or clean pump by removing casing cover without disturbing connections. You may also remove impeller in the same way.
4. Bearings Prelubricated and fully protected from liquids pumped.
5. Can be adjusted for wear—If wear eventually occurs between impeller vanes and casing, you can adjust clearance using outboard bearing locking collar.

Materials of construction

Fig. 3705 is stocked in No. 316 and FA 20 stainless steel. Can be furnished in other metals or alloys to suit conditions of service. See Bulletin for complete specifications.

Interchangeable parts

Goulds paid particular attention to using interchangeable parts. You will need fewer spare parts for this new pump. See Bulletin for interchangeability chart.

MEMBER

For complete information on this advance design Stainless Steel Pump send coupon for FREE Bulletin.

GOULDS PUMPS INC.
Dept. CE, Seneca Falls, N. Y.

Please send your FREE Bulletin.

NAME _____

COMPANY _____

STREET _____

CITY _____ STATE _____

Goulds PUMPS INC. Seneca Falls New York

ATTENTION, NORDSTROM VALVE USERS:

LUBRICATE $\frac{1}{10}$, $\frac{1}{20}$, $\frac{1}{50}$, $\frac{1}{100}$ AS OFTEN

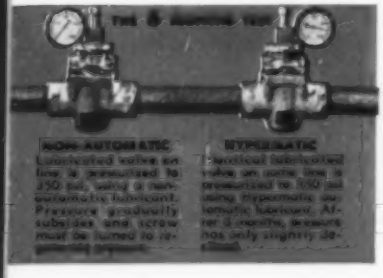
with Hypermatic

THE miracle LUBRICANT

Automatic lubrication—

SAVES MAN-HOURS, SAVES LUBRICANT

The immediate and eager acceptance of Rockwell Hypermatic lubricant has been phenomenal. Now, more than 5,000,000 Nordstrom valves can be automatically lubricated by changing to Hypermatic. There's nothing to purchase but the lubricant. Impressive savings in man-hours will be made in servicing your Nordstrom valves because Hypermatic works while your maintenance men are absent. It automatically force-feeds and seals any voids which would cause leakage. It stays energized for prolonged periods of time. Less lubricant is used because the valve is not over-lubricated but is fed the precise amount for perfect lubrication. In the event of an emergency closure the valve is always ready to be operated. The maintenance man will not have to stop and refill the chamber with lubricant before turning the plug. Hypermatic maintains automatic energized action as long as the pressure of the lubricant is above 50 lb.

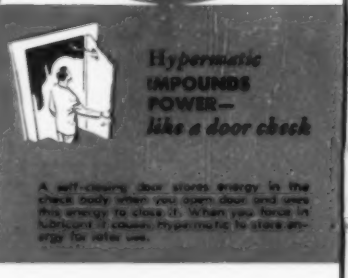


NON-AUTOMATIC
Lubricated valve on line is pressured to 350 psi, using a non-automatic lubricant. Pressure gradually subsides and screw must be turned to re-pressure system.

HYPERMATIC
Identical lubricated valve on same line is pressured to 350 psi using Hypermatic automatic lubricant. After 3 months, pressure has only slightly decreased.

THE SCAVENGER TEST

Inject Hypermatic in any Nordstrom valve. Turn plug half open. Then scrape away all lubricant in the plug's exposed vertical groove. Close valve. Wait a few seconds. Then, turn half open to expose grease in port. Presto,—new lubricant has completely filled the groove.



Hypermatic IMPOUNDS POWER— like a door check

A self-closing door stores energy in the check body when you open door and uses this energy to close it. When you force in lubricant it stores Hypermatic to store energy for later use.

ROCKWELL Hypermatic LUBRICANT

TRADE MARK

PATENTS APPLIED FOR

energizable

Buy it—Try it—Keep upkeep down

Immediate deliveries

Rockwell Hypermatic lubricant is available in the principal types for most services at normal temperatures. It comes in stick form and soft bulk. You may order through nearest distributing point or direct. Be sure to specify Hypermatic.

Genuinely automatic

Hypermatic is of itself automatic —not dependent upon pressure in the pipeline which can fail, or any mechanical contrivance. It stores its own energy.

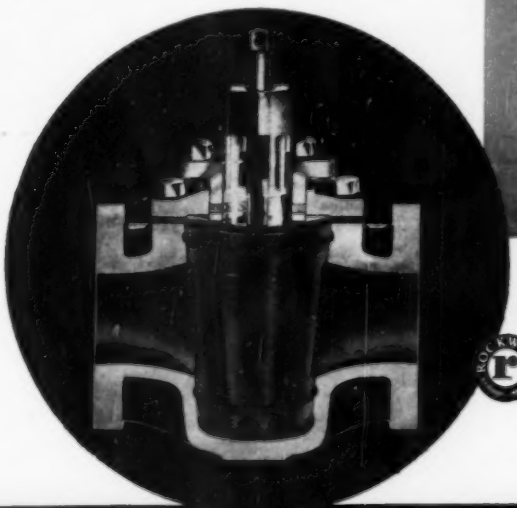
...a hit!

Hypermatic seals instantly and keeps valves sealed

The reason there are over 5,000,000 Nordstrom valves in service is because they are the most dependable type of positive closure known to industry. Lubrication performs the triple function of lubricating the plug, sealing the ports and jacking the plug. Lubrication is the "making" of the valve. There's no substitute for lubricant. It's vital. Now, we have miraculously improved the lubricant by development of Hypermatic. Fundamentally, a valve is used to shut off a line. To do that, a valve must be in itself a perfect seal. Hypermatic, with its impounded energy, keeps the valve sealed.

Gives Nordstrom valves greater efficiency, longer life

Nordstrom put pressure lubrication into plug valves, permitting practical use of this type of valve in industry. Then "Sealdport" lubrication was added so that the ports were securely sealed on all sides. Then other major improvements were brought forth, such as the Hypreseal design, Merchrome coating, use of stainless steel and special alloys. NOW the greatest of valve advancements—Hypermatic automatic lubrication—gives to Nordstroms the effect of an improved design.



WHY PLUG VALVE LUBRICATION *is vitally essential*

1. ROTARY ACTION, MOST POSITIVE CLOSURE

Simplest valve design is a tapered plug. When properly tapped and fitted, it forms a tight closure, but it must be lubricated to insure easy turning and tight sealing.

2. PLUG SURFACE SEALED ON LUBRICANT FILM

The Nordstrom valve employs pressurized lubrication which evenly distributes a film over the entire seating surface which is never exposed to the line. Easy turning is assured.

3. POSITIVE PRESSURE SEAL AROUND EACH PORT

Nordstrom "Sealdport" lubrication, by ingenious locating of connecting grooves in the plug and body, forms a pressure seal around each port which prevents internal and external leakage.

4. HYDRAULIC JACKING ACTION FREES PLUG

A few turns of the external lubricant screw regenerate pressure. If the plug is too tight to turn easily, a few extra turns of the screw hydraulically jacks the plug, freeing it.

5. HYPERMATIC LUBRICANT SELF-ENERGIZES FEED

As the "sensing link" in perfect valve operation, Hypermatic lubricant now gives to Nordstrom valves automatic lubrication. Being self-energized by screwing down the lubricant screw, Hypermatic stores powerful energy to maintain constant feed indefinitely—for months in cases where valves are infrequently operated.

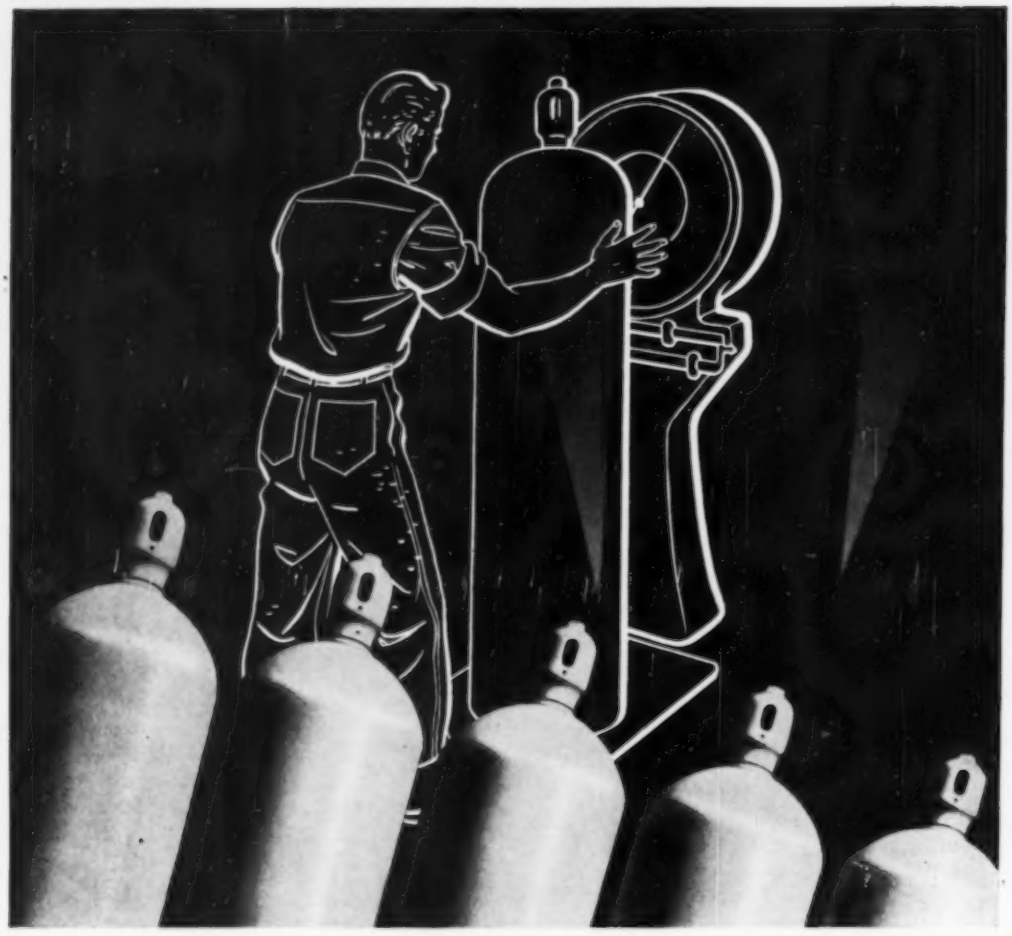
6. INSTANT CLOSURE IN EMERGENCY OR OTHERWISE

No longer is it necessary to refill an unserviced valve with lubricant before operation. By using Hypermatic, the valve is kept fully lubricated, ready to open or close instantly.

Directly Multiplies Valve Life by Maintaining Valves in Fully Lubricated Condition—Seven Main Points

Nordstrom LUBRICATED VALVES

NORDSTROM VALVE DIVISION—Rockwell Manufacturing Co.
400 North Lexington Avenue • Pittsburgh 8, Pennsylvania
Atlanta, Boston, Chicago, Columbus, Houston, Kansas City, Los Angeles, New York, Pittsburgh, San Francisco, Seattle, Tulsa . . . and leading Supply Houses • Export: Rockwell Manufacturing Co., International Division, 7701 Empire State Bldg., New York 1



COSTS WEIGH LIGHTER WITH HACKNEY LIGHTWEIGHT CYLINDERS

Yes, costs do weigh lighter on the minds of shippers using Hackney Cylinders. That's because Hackney Cylinders are comparatively light in weight to assure shipping and handling economies.

They give utmost protection, too—thanks to their rugged strength. It's the Hackney Deep Drawing Process that makes possible both these desirable qualities—strength and light weight—as it assures uniform sidewall thickness and eliminates all excess material. Then, to improve the physical properties still further, controlled heat-treating is employed after complete fabrication.

Write for full details

Hackney

PRESSED STEEL TANK COMPANY

Manufacturers of Hackney Products

Main Office and Plant: 1447 South 66th Street, Milwaukee 14, Wis.

1325 Vanderbilt Concourse Building, New York 17 — 203 Hanna Building, Cleveland 15

208 South LaSalle Street, Room 2070, Chicago 4 — 553 Roosevelt Building, Los Angeles 14

CONTAINERS FOR GASES, LIQUIDS, AND SOLIDS

NEW TYPE "S" B-P TER MEER CONTINUOUS CENTRIFUGALS

speed production of free draining slurries

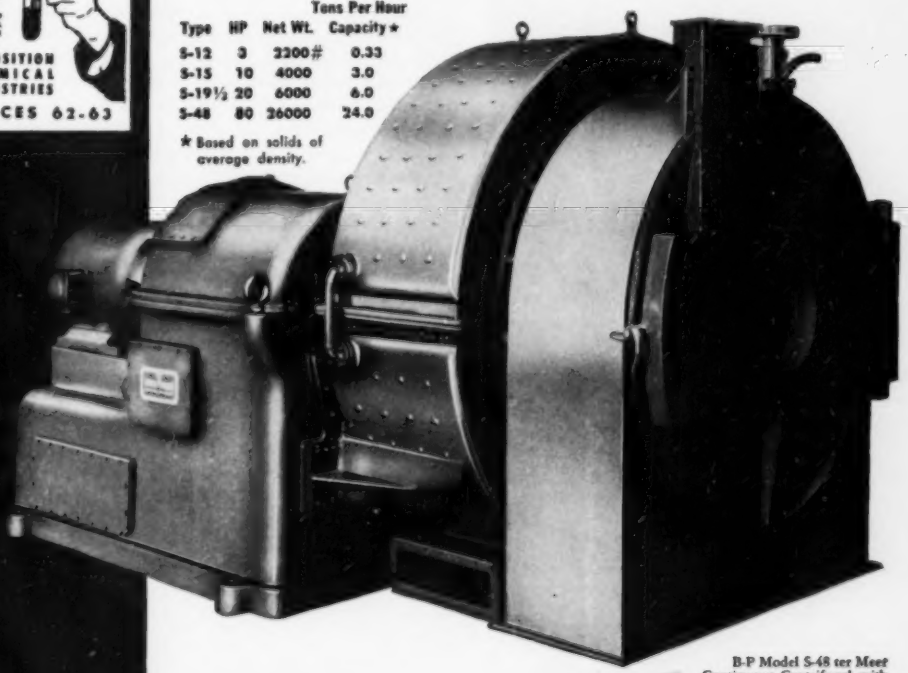
The new Baker Perkins Type "S" ter Meer Continuous Centrifugals now de-water greatly increased quantities of free draining crystalline, granular and fibrous materials.

The new Model S-48, for example, can now de-water up to 24 tons of material* per hour, as compared with 8 to 10 tons per hour in the old model.

Other re-designed models have *increased production capacities on an average of 50 per cent.* These new B-P Centrifugals have jacketed wet housings as optional equipment in which hot or cold liquids or gasses can be circulated for controlling working temperatures. An inspection door in the discharge chamber can be opened for close observation of centrifuging while the machine is in operation and makes the machine readily accessible for cleaning.

Type	HP	Net Wt.	Tons Per Hour Capacity ★
S-12	3	2200#	0.33
S-15	10	4000	3.0
S-19½	20	6000	6.0
S-48	80	26000	24.0

★ Based on solids of average density.



B-P Model S-48 ter Meer Continuous Centrifugal with 48" drum; develops 250 x G with 50 HP drive motor; and 30 HP oil pump motor. Write for complete information.

BAKER PERKINS INC.

Chemical Machinery Division, **SAGINAW, MICHIGAN**

Easy to wear, effective *for the chemical*

M·S·A

Chemgard

APRONS AND SLEEVES

Tailored of easy-draping, translucent, flexible plastic, these modern protective garments combine correct fit with comfort and durability. Resistant to corrosive chemicals, harmful liquids, oil and grease, Chemgard Sleeves and Aprons feature electronically-welded seams throughout. Plastic neck and waist straps are bonded permanently to garment at one end, with adjustable fastener at opposite end. Non-absorptive, resistant to hardening, snagging and abrasion—odorless, easy to clean and keep clean! *Bulletin CZ-2.*

M-S-A SKULLGARD

Industry's most popular work hat for comfort with patented head protection. Tough, sturdy, unaffected by common chemicals, water or grease—high dielectric strength—flexible sweatband and shock-absorbing inner head cradle for day-long wearing ease. *Bulletin DE-13.*

M-S-A FACESHIELDS

Wide-area face and neck safety against acid splashes, light flying particles, etc. Visor of clear acetate plastic is quickly replaceable—molded fiber headgear is shaped to fit the head, with weight supported by coarse crown straps. Instant size adjustment. *Bulletin No. CH-5.*

M-S-A RUBBER FRAME GOGGLES

Molded, pliable rubber gasket with indirect ventilation helps prevent entry of chemical fluids, dusts and low-velocity particles. Large, shatter-resistant acetate lens, easily replaceable. Frame provides air-tight seal on face without binding. *Write for details.*

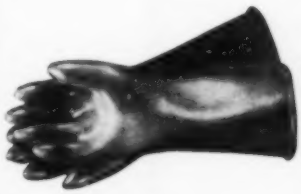
head-to-foot protection industries worker—by MSA

SAFETY EQUIPMENT HEADQUARTERS

M·S·A Acid Hood

Covering head, shoulders, back and chest, safely protecting the wearer against acid splashes and sprays, the specialized M.S.A. Acid Hood combines lightweight comfort with unobstructed vision through a large, replaceable plastic lens.

Made of vinyl plastic, unaffected by acids, caustics, corrosive liquids, oil or grease, the Hood snap-fastens to pivoted shell and adjustable headgear of white coated vulcanized fiber. Baffled air vents at sides prevent entry of splashed liquids. *Write for Bulletin CF-24.*



M·S·A RUBBER GLOVES

Including rubber acid gloves, synthetic white rubber gauntlets, neoprene latex, synthetic coated fabric, and turn-cuff gloves. Sizes, lengths, weights as specified. *Write.*

M·S·A WHITE RUBBER BOOT

Shows acid splashes clearly. All-rubber, well-reinforced at wearing points for hard service. Tough, durable sole and heel are heavily corrugated to prevent slipping. *Bulletin CL-4.*

M·S·A WURKSHU

Water and acid proof—made of black synthetic rubber, over regular work-shoe last. Blucher upper, flexible sole, sponge cushion insole and steel Safety Toe. *Write.*

M·S·A FEND

A wide range of industrial skin creams, formulated for barrier protection against scores of specific skin irritants. *Bulletin FA-79.*

MINE SAFETY APPLIANCES COMPANY

BRADDOCK, THOMAS AND MEADE STREETS · PITTSBURGH 8, PA.

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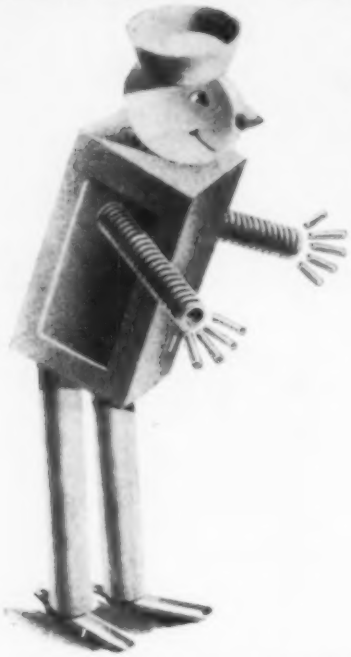


Norton Company
Booth 415-416
The Chemical Show
Grand Central Palace
Nov. 28 to Dec. 3

PURE OXIDE REFRACTORIES. A varied selection of products made from the pure oxides of alumina, magnesia, stabilized zirconia and thoria, will be displayed in our booth at the Chemical Show. We cordially invite you to visit our exhibit and see these high temperature refractories which may be used at temperatures up to 2500° C. (4532° F.). These high temperature products are permitting industry to undertake many operations which were not possible previously with less refractory substances. Furthermore, the purity of these pure oxide refractories makes them chemically stable in operations where less pure products often suffer chemical deterioration. Norton pure oxide refractories are currently being produced in the form of standard brick shapes, large furnace shapes, and small furnace shapes and laboratory ware. See these products at Booth 415–416 at the Chemical Show.

For technical data on these and other Norton high temperature refractories, write for our free bulletin No. 151.

NORTON
REFRACTORIES

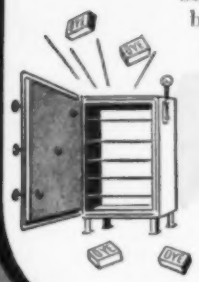
NORTON COMPANY, WORCESTER 6, MASS.

Making Better Products to Make Other Products Better

ASK STOKES

If Drying is the Question

"How best to dry it?" is one of the most frequent questions in chemical processing. Its successful answer may make the difference between a profit and a loss . . . the difference between a fairly good and an excellent end-product.



Because of the wide diversity of materials to be dried, Stokes has developed drying methods and equipment for almost anything you can name. Single and double drum atmospheric dryers, rotating or rotary vacuum dryers, warm air shelf dryers, vacuum shelf dryers, freeze dryers . . . these units, in the widest range of sizes, provide the capacities and economies you require.

And the Stokes semi-plant-scale laboratory will test-dry samples for you so the results may be checked before you invest.

Stokes experienced process engineers are ready to work with you on your drying problems.

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5920 Tabor Road, Phila., 20, Pa.

Stokes makes Chemical and Food Processing equipment, High Vacuum Pumps and Gages, Vacuum and Atmospheric Dryers, Pharmaceutical equipment. Tablet Machines, Water Stills.

STOKES KNOWS HOW

TOLHURST

SUSPENDED CENTRIFUGALS

Since 1892, the chemical industry has relied on Tolhurst Suspended Centrifugals for processing heavy chemicals. These suspended models operate with equal ease and assurance of safety whether slow or fast starts or repeated short cycles at full speed are required.

Centrifugally operated clutch provides greater flexibility in unloading and loading . . . more economical use of power. Perforate or imperforate baskets can be furnished. Baskets, linings, and covers constructed of corrosion-resistant material. Basket sizes: 26", 32", 40" and 48". Write today for catalog and prices.

LABORATORY SERVICE AVAILABLE

For confidential, unbiased and intelligent recommendations on your centrifugal problems, consult Tolhurst with its well-qualified staff and modern research facilities.

DO THESE 6 JOBS FASTER MORE ECONOMICALLY

- FILTERING
- DRAINING
- DEHYDRATING
- CLARIFYING
- THICKENING
- SEPARATING

TOLHURST LABORATORY CENTRIFUGALS

For extracting small batches of work in laboratories and pilot plants. Tolhurst Laboratory Centrifugals have proved universally popular. Can be constructed of stainless steel, monel, bronze, or steel rubber covered. 12" diameter basket.

Tolhurst Centrifugals

Division of [illegible], Troy, New York, and Tolhurst Sales Corporation, East Moline, Illinois

SCRUBBING CORROSIVE GASES ?

Fig. 645

Are your scrubbing nozzles as efficient as you think they *could* be? Do they resist the corrosion or wear conditions satisfactorily– Produce the breakup and distribution you would like?

Right now thousands of Monarch Fig. 645 nozzles are scrubbing all kinds of gases all over the world . . . Perhaps they can do a *better* job *for you!*

Outline your spray problem for us—if your liquid can be sprayed with direct pressure at all—Monarch can furnish the nozzles.

NOZZLES FOR:

- OIL ATOMIZING
- HUMIDIFYING
- AIR WASHING
- DESUPERHEATING
- SPRAY PONDS
- MILK POWDERING
- ACID CHAMBERS
- CONCRETE CURING

Write for Catalogs 6-A and 6-C

MONARCH MFG. WKS. INC.

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PHILADELPHIA 34, PA.

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to see a model demonstration of the

WIGGINS GASHOLDER

WIGGINS GASHOLDER FOR OPERATING ECONOMIES

BECAUSE IT—

1. Takes advantage of the strong, flexible, impervious qualities developed in synthetic rubber fabrics by the chemical and process industries.
2. Has an absolutely dry frictionless seal.
3. Is unaffected by heat, cold, ice, snow, wind or rain—even earthquakes.
4. Delivers gas exactly as received, dry, pure, undiluted.
5. Has less than ½ of 1% dead space for quick purging.
6. Will give years of continuous performance without mechanical servicing.

WHICH MEANS—

NO OPERATING COSTS
PRACTICALLY NO MAINTENANCE

GENERAL AMERICAN TRANSPORTATION CORPORATION

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BOOTHS 243-245 22nd EXPOSITION CHEMICAL INDUSTRIES

Dress up your bulk shipments in

Decorated LEVERPAK DRUMS

choice of (17) colors . . . choice of (14) inks

NOW YOU CAN deliver your dry bulk products in style—make them part of your package "family"... traveling billboards through all stages of use and reuse.

Continental can supply you with improved Leverpak drums in any of seventeen eye-catching colors. We can reproduce your name and trademark in any of fourteen different inks. And there's no waiting for this service. We're set up to start the drums rolling your way as soon as you give us the word.

LEVERPAKS—unpainted or in colors—are the best-looking, most serviceable fibre shipping drums we have ever turned out. They load compactly and ride safely. The patented locking device is easy to open, easy to close. Metal chimes are flash butt welded for greater strength.

If you want a sturdier container . . . one that will "dress up" your bulk shipments, contact our nearest office for full details on Leverpak and other Continental drums.

CONTINENTAL CAN COMPANY

Paper Converting Division • *Fibre Drum Section*

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ANNOUNCING 6″ DIAMETER PYREX BRAND GLASS PIPE!

To its regular line of 1″, 1½″, 2″, 3″ and 4″ PYREX brand Glass Pipe, Corning adds a new 6″ diameter. It is available in standard lengths of ten feet. Six inch fittings include elbows, tees, crosses and reducers.

Balanced stocks of PYREX brand glass pipe and fittings in all sizes are maintained and shipments can be made to any point quickly after orders are received.

CORROSION CONTROL AT LOWEST COST

A recent survey taken among users of PYREX brand Glass Pipe shows that it is considered the lowest cost piping material with which to control corrosion. There are over twenty years of satisfactory experience *behind* the product.

MAKE THIS SIMPLE TEST

If you haven't had any experience in using PYREX Pipe in your process lines, make a modest test installation! It can be assembled to any other piping or process equipment by means of adaptor flanges. This simple test will show how practical PYREX Pipe is, not only in combating corrosion but also in giving you longer service plus visibility and easy cleanability.

NEW INSTALLATION BULLETIN!

SEE HOW OTHERS ARE using PYREX brand Glass Pipe in their operations. Write for the new Corning booklet, "PYREX brand Glass Pipe in the Process Industries." Use convenient form below.

CORNING GLASS means research in glass

PYREX

PLANT EQUIPMENT SALES DEPARTMENT
CORNING GLASS WORKS, CORNING, N. Y.

TECHNICAL PRODUCTS DIVISION: GLASS PIPE • SIGNALWARE • LABORATORY GLASSWARE • GAUGE GLASSES • LIGHTINGWARE • OPTICAL GLASS • GLASS COMPONENTS

CORNING GLASS WORKS, Dept. CE-11, Corning, N. Y.

☐ We are interested in 6″ PYREX brand Glass Pipe. Send full particulars.

☐ Send copy of booklet, "PYREX Pipe in Process Industries."

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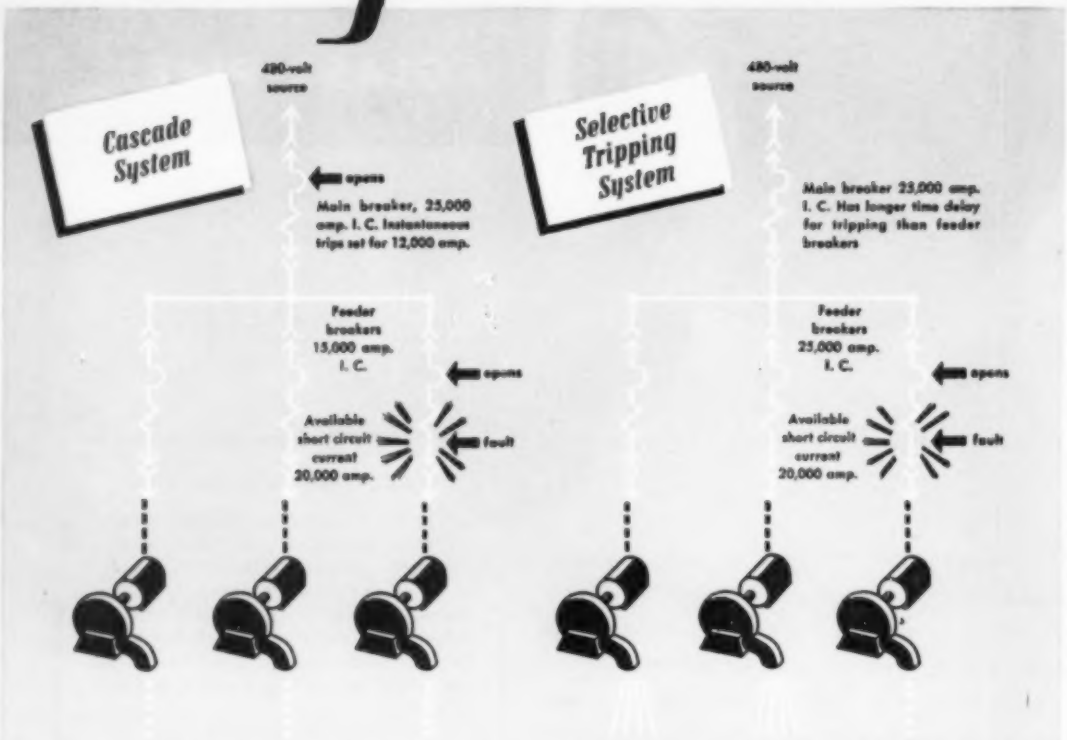
CITY_____ ZONE____ STATE_____

What's the trend in chemical plant electrification? } ...better


Cascade System
480-volt source
opens
Main breaker, 25,000 amp. I. C. Instantaneous trips set for 12,000 amp.
Feeder breakers 15,000 amp. I. C.
opens
Available short circuit current 20,000 amp.
fault
Selective Tripping System
480-volt source
Main breaker 25,000 amp. I. C. Has longer time delay for tripping than feeder breakers
Feeder breakers 25,000 amp. I. C.
opens
Available short circuit current 20,000 amp.
fault

Cascade system is used where service continuity is not a "must." Here the main air circuit breaker is used to assist the feeder breaker to interrupt all faults over 80 per cent of feeder breaker's capacity. Lesser fault currents are interrupted by the feeder breaker alone.

Selective tripping system lets feeder air circuit breakers interrupt *all* fault currents on feeders. Main air circuit breaker opens only for bus faults or because of failure of feeder breaker. Thus, a short circuit in one feeder does not interrupt power to other feeders.

Here's what you need to modernize your power system! }

WHEN YOU COME TO GENERAL ELECTRIC you get far more than the finest in electrical equipment. A General Electric application engineer, familiar with chemical plant practice, is at your disposal. If desired, he stands ready to take over the job of co-ordinating all the needed components, engineering your power distribution into one modern, efficient system.

protection against shutdowns

WITH SELECTIVE TRIPPING

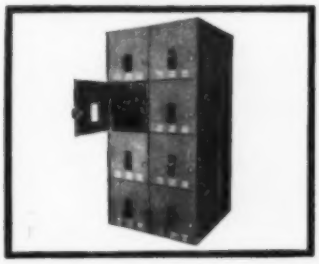
—to isolate faults on low-voltage circuits

Although comparatively new, selective tripping of air circuit breakers is becoming increasingly important in the field of low-voltage power distribution. Especially is this the case in applications—such as continuous processing in chemical plants—that require a high degree of service continuity. By isolating faults at remote points without tripping the main supply breaker, this method eliminates the costly production delays caused by complete power shutdowns.

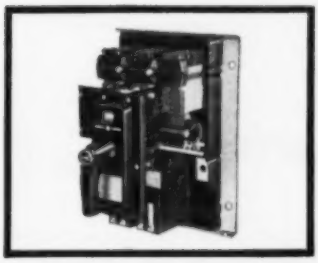
With selective tripping, full interrupting-rating breakers are used throughout, with differently-timed tripping ranges arranged so that the breaker farthest from the power source trips first. Thus, only that portion of the circuit nearest the fault is isolated. The rest of the power system stays in operation, permits uninterrupted production elsewhere in the plant.

For complete information on this new and cost-saving way of protecting your important low-voltage circuits, write for Bulletin GET-1485 "Selective Operation with Air Circuit Breakers." *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

FREE G-E AIDS TO POWER SYSTEM SAVINGS! Here are ideas you can use on how to cut the cost of power distribution—your plant's most critical "materials handling" problem. Offered by General Electric as a service to your industry, they're contained in a full-color sound slidefilm, a factual manual, and a supplementary review booklet. All this is available to you and your organization without charge. Just ask your G-E representative to arrange for a showing of the film "Modern Industrial Power Distribution."



G-E metal-enclosed switchgear, containing air circuit breakers with new trip device, needs less floor space. Features include new rack-out mechanism, improved bus construction.



In the G-E Type AK-1 air circuit breaker (shown here with one trip device removed) you get improved arc interruption, multiple arcing contacts, and interchangeable trip units.

New G-E Type EC-1 tripping device for AK-1 air circuit breakers is sealed to eliminate maintenance, easily adjusted, readily removable for changing trip characteristics.

GENERAL ELECTRIC

660-82

BOOTHS 366-368 22nd EXPOSITION CHEMICAL INDUSTRIES

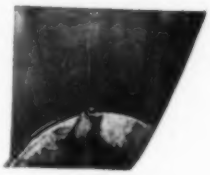
LEAD LININGS

...blunt the teeth of Hungry Acids

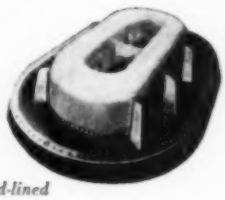
In unnumbered processing plants across the country, sheet lead plays a vital role in keeping acids under control. Because, among other unique properties given lead by nature, is *stern resistance to corrosion.*

It is this innate ability to blunt the teeth of hungry acids, coupled with several of lead's other "abilities"—adaptability, workability, durability and availability—that makes the use of lead a virtual "must" as a lining for tanks, tubs and vats in which corrosive liquids are handled, moved or stored.

National Lead markets sheet lead of several types—chemical, antimonial, tellurium and antimonial-tellurium. Each has its functional place in the processing field. All are produced with a know-how that makes the most of the metal's inherent qualities. From starting slab to sturdy sheet, the rolling is done under the watchful eyes of experienced operators. The sheet comes off the cutting table smooth, uniform, and true to weight and dimensional specifications.



If your acid-handling activities demand lead's unusual combination of properties, use National Lead sheet. And if you would like our views on ways and means of getting optimum results from sheet lead installations, consider us at your service.



Look to the Leader for Lead

...in everything from lead pipe...valves...sheet...and lead-lined or lead-covered equipment...to complete acid recovery plants

NATIONAL Lead Company

New York 6; Baltimore 3; Buffalo 3; Chicago 8; Cincinnati 3; Cleveland 13; Pittsburgh 12; St. Louis 1; Boston 6 (National Lead Company of Mass.); Los Angeles 23 (Morris P. Kirk & Son, Inc.); Philadelphia 25 (John T. Lewis & Bros. Co.); Atlanta (Georgia Lead Works, Div. of Cincinnati Branch); Toronto, Canada (Canada Metal Co. Ltd.).

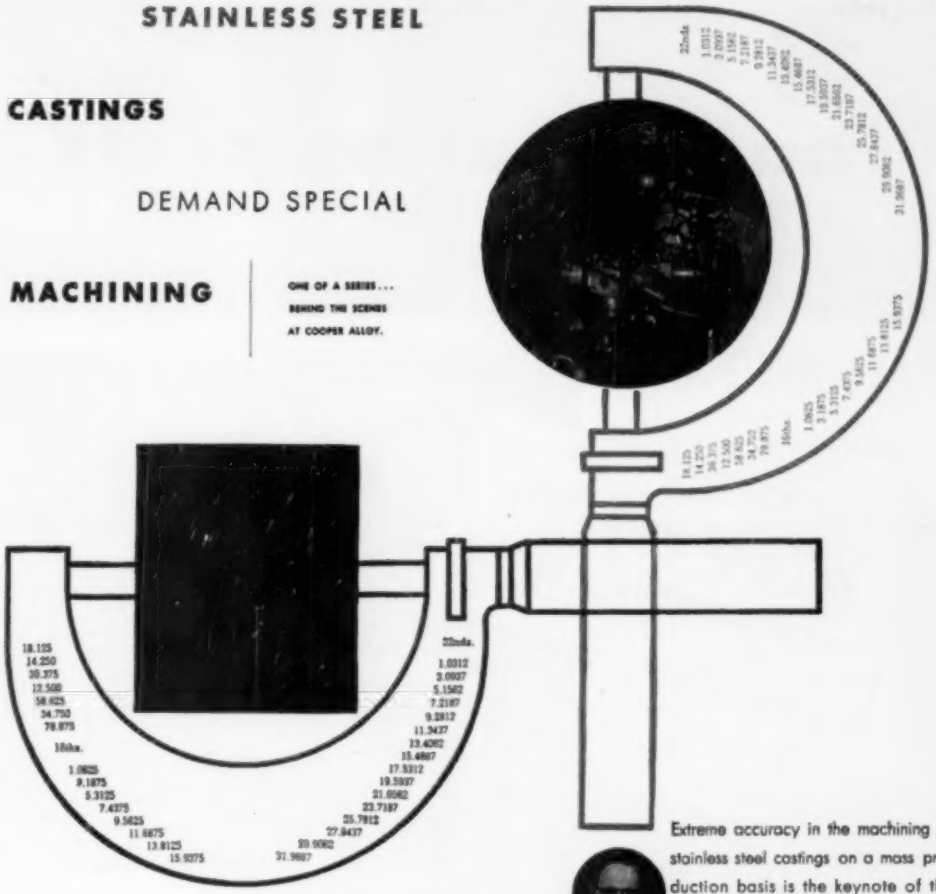
STAINLESS STEEL

CASTINGS

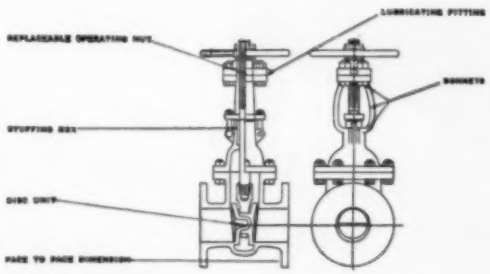
DEMAND SPECIAL

MACHINING

ONE OF A SERIES...
BEHIND THE SCENES
AT COOPER ALLOY.



Extreme accuracy in the machining of stainless steel castings on a mass production basis is the keynote of the Stainless Engineering and Machine Works, the division of Cooper Alloy responsible for keeping pace with the foundry's output of nearly 1,000,000 lbs. per month • Heading this department of experts in the machining of stainless steel is M. J. Robert, a pioneer in the development of the advanced techniques employed in the machining of Cooper Alloy valves, fittings and special castings. Every machinist under his supervision has completed a rigorous training course and the department's rejection rate is one of the lowest in the entire steel industry.



YOURS FOR THE ASKING!

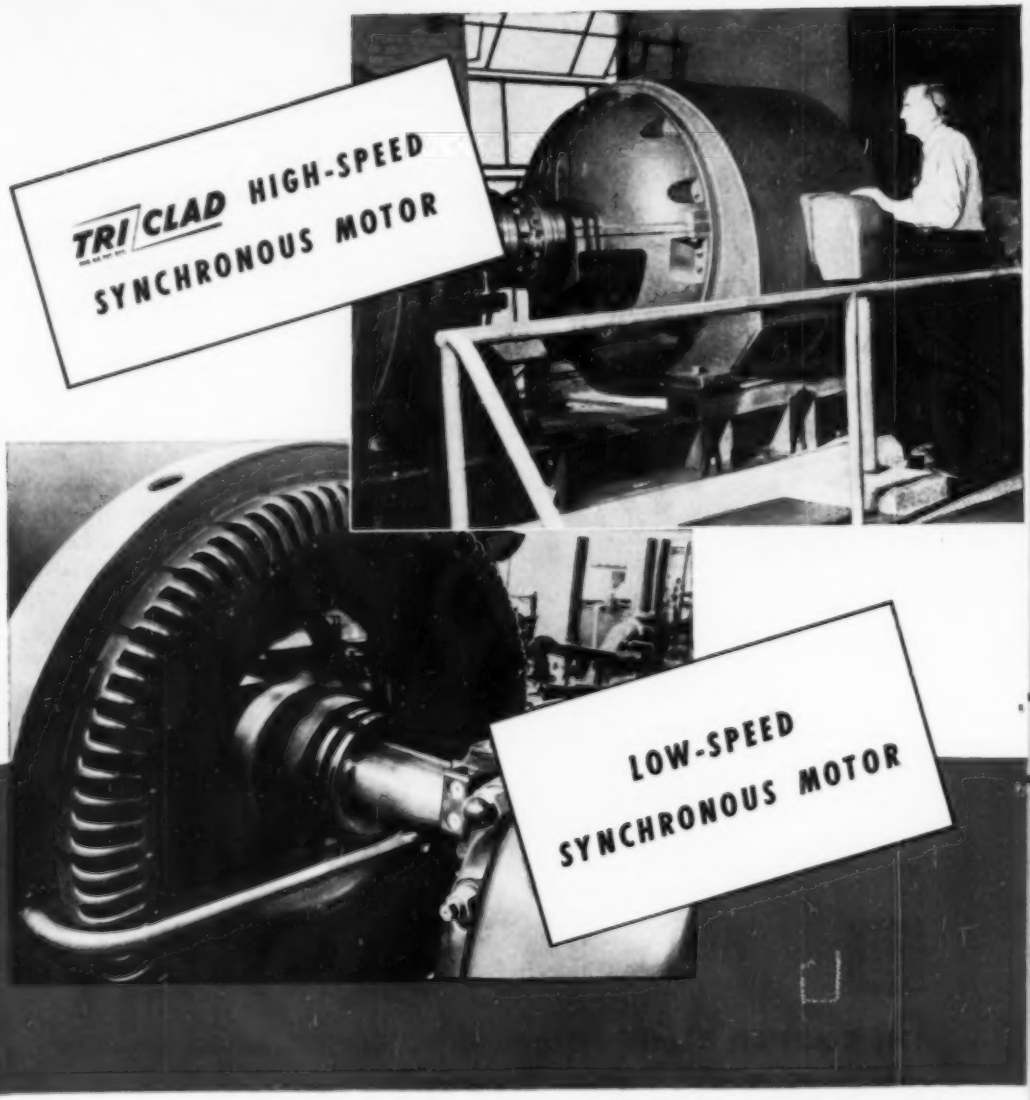
Write for folder on "Suggested Methods of Threading and Assembling Stainless Steel Pipe & Pipe Fittings."

THE **COOPER ALLOY** FOUNDRY COMPANY **HILLSIDE, NEW JERSEY**

THE WORLD'S LARGEST FOUNDRY DEVOTED EXCLUSIVELY TO THE CASTING OF STAINLESS STEEL

BOOTH 4 22nd EXPOSITION CHEMICAL INDUSTRIES

SAVE on operating costs



USE GENERAL ELECTRIC SYNCHRONOUS MOTORS

SYNCHRONOUS MOTORS PAY THEIR OWN WAY

Yes, in certain applications a synchronous motor is cheaper to operate because it is more efficient than other electric motors.

Here's an example:

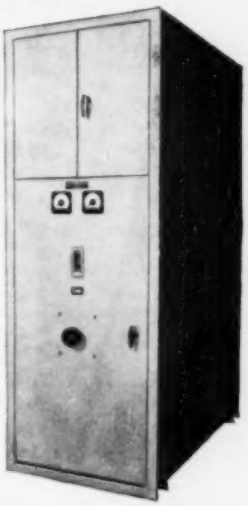
Compare a 200 hp, 2300 volt, 900 rpm synchronous motor with another type of motor of the same rating. Actual testing shows that the synchronous motor including its exciter loss is around 94% efficient while the other motor is about 92% efficient. The two per cent gain by the synchronous motor looks small but in this instance, where the motor operated sixteen hours a day, it meant a $200.00 annual saving in power costs, based on a $.01 per kwh power cost.

Your General Electric salesman can point out many applications where **synchronous motors have a lower initial cost** in addition to **lower operating cost.**

REMEMBER—Efficiency pays off in dollars and General Electric synchronous motors give you increased efficiency, in many instances at **lower first cost.**

Don't think of buying your next motor without seriously considering the application of **money-saving synchronous motors** in your plant. Call your G-E salesman right now, he has good news for you. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

G-E SYNCHRONOUS MOTOR CONTROL GUARDS EFFICIENCY



The new G-E synchronous motor control provides the accurate adjustments that enable you to improve power factor—increase efficiency. Here's where details count—where the slightest variation of a pointer on a meter means money saved—or lost. New meter design prevents any possibility of misreading the scale.

The new, smaller rheostat, too, has design features that not only result in longer life, but in greater operating convenience and accuracy. You can be sure, too, that the new field circuit will respond instantly to rheostat adjustment.

Steel cabinets not only protect personnel and equipment, but are designed to line up with other G-E power units such as switchgear, thereby improving plant appearance.

Ask your nearest G-E office for more information about this equipment that safeguards your investment . . . helps save on operating expenses.

GENERAL ELECTRIC

Apparatus Dept., Sec. A770-8,
General Electric Company
1 River Road, Schenectady 5, N. Y.

Gentlemen: I would like more information on the advantages of synchronous motors. Please send me the indicated descriptive literature.

Low Speed	*High Speed*	*Control*
☐ GEA-529D	☐ GEA-5113	☐ GEC-505

Name .....

Company .....

Street .....

City ..... **State** .....

DON'T MISS THIS EXHIBIT

OUR SECTION of the Engelhard Industries exhibit at the Twenty-Second Exposition of Chemical Industries, Grand Central Palace, New York, will offer you a rare opportunity to see the multitude of applications of the platinum metals in industry.

Among the important items we will have to show you will be Platinum Gauze for Ammonia Oxidation, Platinum Laboratory Ware, Platinum Electrodes, Platinum Clad, Spinnerettes for Synthetic Fibres, Thermocouple Wires, Platinum and Palladium Catalysts on various carriers, Precious Metal Salts and Solutions, Platinum for the Glass Industry, Silver Gauze and many other items.

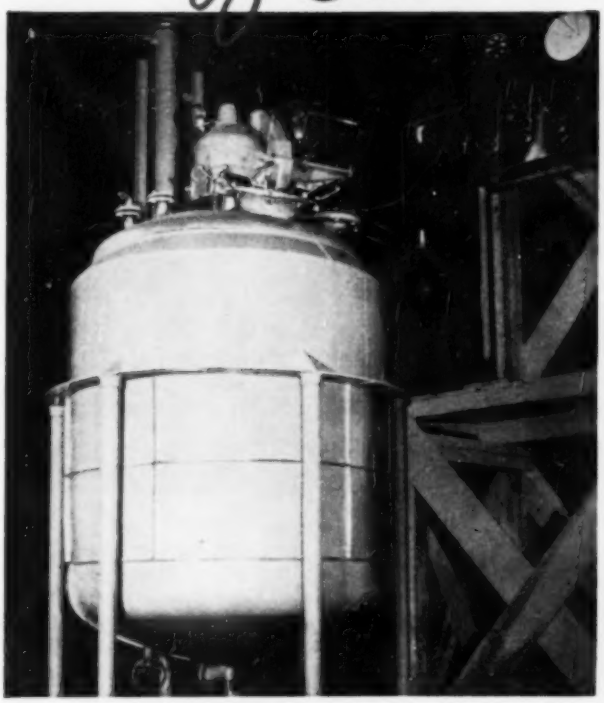
See the Nitroneal Generator

This new Generator can reduce your nitrogen gas cost as much as 90%. By means of Engelhard catalysts, it produces a pure nitrogen gas with a controllable hydrogen content (.1% to 40%) without any explosive hazard.

With the direct ammonia-air reaction, there is a gain of two volumes of nitrogen for each volume of hydrogen removed. Capacities are from 100 cfh to 10,000 cfh.

BAKER & CO. INC.
BOOTHS NOS. 451-452
GRAND CENTRAL PALACE, NEW YORK

Resistance to Adherence —another Cost-cutting Characteristic of Stainless Steel



STAINLESS Steel has built its reputation in the chemical processing industry on its established ability to resist corrosion, resist heat and resist hard usage. But there's another factor of resistance, not so widely recognized but highly important from the standpoint of production economies—resistance to adherence.

Stated simply, this means that certain materials, which during processing have a tendency to cling to common steel (or to the coating with which such steel is protected), *will not stick to Stainless Steel.* Numbered among these materials are food products, gums from rayon and other textile fibers, dyes, wood gums, resins.

As a result of its ability to resist adherence, Stainless Steel equipment makes possible these important savings in time and costs:

Machinery can be kept in operation for much longer periods without cleaning.

Errors in control of process temperatures will result in less damage to equipment.

Spoiled materials can be cleaned or scoured away with less time and labor, and with less damage to equipment.

These advantages, plus the many other cost-saving characteristics of Stainless, you can obtain at their best in U·S·S Stainless Steel—a perfected, service-tested Stainless, uniform in composition, finish and quality.

AMERICAN STEEL & WIRE COMPANY, GENERAL OFFICES: CLEVELAND, OHIO · CARNEGIE-ILLINOIS STEEL CORPORATION, PITTSBURGH & CHICAGO
COLUMBIA STEEL COMPANY, SAN FRANCISCO · NATIONAL TUBE COMPANY, PITTSBURGH · TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM
UNITED STATES STEEL SUPPLY COMPANY, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST · UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

U·S·S STAINLESS STEEL

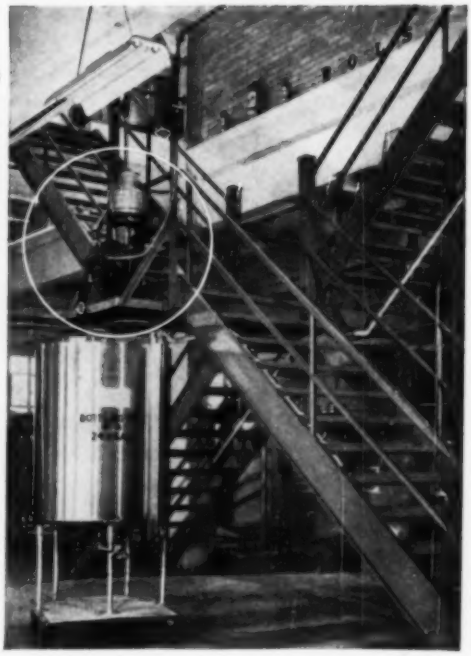
SHEETS · STRIP · PLATES · BARS · BILLETS · PIPE · TUBES · WIRE · SPECIAL SECTIONS

UNITED STATES STEEL

Another Interesting Job For Me!

CLARIFYING BOLS ADVOKAAT

● Can I Help You?



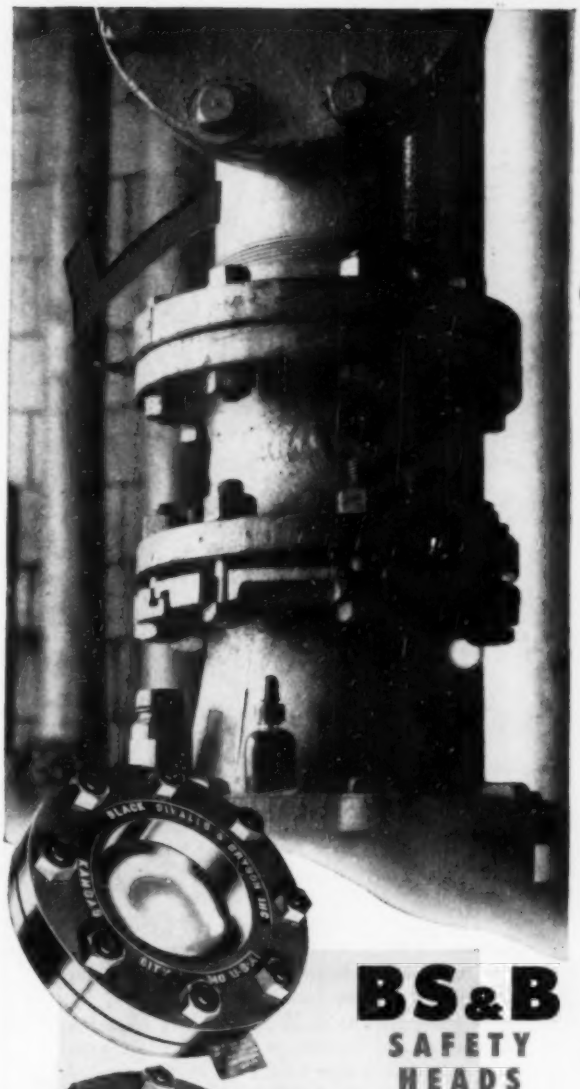
De Laval Centrifugal Force is used in an interesting manner in making Bols Advokaat. This rich egg liqueur, product of Erven Lucas Bols, is made from the yolk of fresh eggs and cane sugar. Fresh eggs contain a natural egg oil. To get a perfectly uniform final product, it is necessary to skim off this egg oil from the finished Advokaat. A De Laval Industrial Separator does the job continuously, making a clean-cut separation with no intermediate layer.

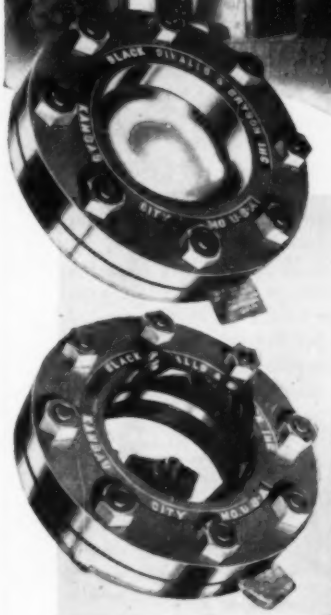
What De Laval Centrifugal Force has done for one processor it may do for you. There is a De Laval Separator or Clarifier for every application where centrifugal force may be applied to advantage.

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

DE LAVAL CENTRIFUGAL PROCESSING SYSTEMS

For SEPARATION • CLARIFICATION • CONCENTRATION





For

Instant Release

from the danger of OVERPRESSURE!

Here, in the Black, Sivalls & Bryson SAFETY HEAD, is a "sure-thing" pressure relief device that has *never failed to work* in all its history. It has no moving parts to stick or get out of order. No thoughtless operator can "screw it down" and prevent it from functioning to protect your personnel and property from destruction.

For the BS&B SAFETY HEAD consists of a simple, pre-formed rupture disc . . . held between specially designed base and hold-down flanges . . . which bursts at predetermined pressure. It is 100 per cent protective! *Nothing* can happen to the SAFETY HEAD that can make it fail to function!

Wait no longer to provide this final safety factor for your personnel and property. Contact the Special Products Division, Black, Sivalls & Bryson, Inc., Power and Light Bldg., Kansas City 6, Mo.

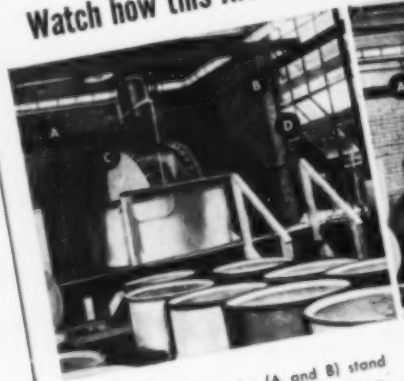
BS&B SAFETY HEADS

Director, Special Products Division, Section SH-5
BLACK, SIVALLS & BRYSON, INC.
Power and Light Building, Kansas City 6, Missouri

I want complete details concerning BS&B Safety Heads.
☐ Arrange to have a Sales Engineer call on me.

Name_____
Firm_____
Address_____
City_____ Zone_____ State_____

Watch how this *Kidde* system puts fire in its place!



Kidde Multijet Nozzles (A and B) stand ready to flood the room with flame-smothering carbon dioxide (CO_2) if a fire should break out. Hatches (C) on mixing tank and window (D) are held open by latches connected to Kidde pressure trips.

Here the system goes into action in a test simulating fire-fighting operation. CO_2 discharges from nozzles A and B, and also actuates pressure trips, allowing hatches C and window D to close. Fire is shut out of the tank—isolated from the rest of the plant.

Remember this ad?

Here's the PROOF of what we said!

A few months ago, the ad above told how this *Kidde* Carbon Dioxide (CO_2) System *would* operate in case of a fire. Here's how it actually *did* operate, says George W. Reed, Supervisor of Safety & Fire Protection, Shellmar Products Corporation, Mount Vernon, Ohio:

"Fire started from spontaneous ignition in some pails stored under metal shelves. This fire was completely extinguished—without any of our fire brigade personnel going into the room.

"We feel that the *Kidde* System did a grand job of getting under the shelves and extinguishing the fire, and that it saved us a lot as to safety of personnel and extra fire damage."

Your plant can have protection like that with a *Kidde* CO_2 System. Just bring your fire-hazard problem to us.

When you think of CO_2, call Kidde!

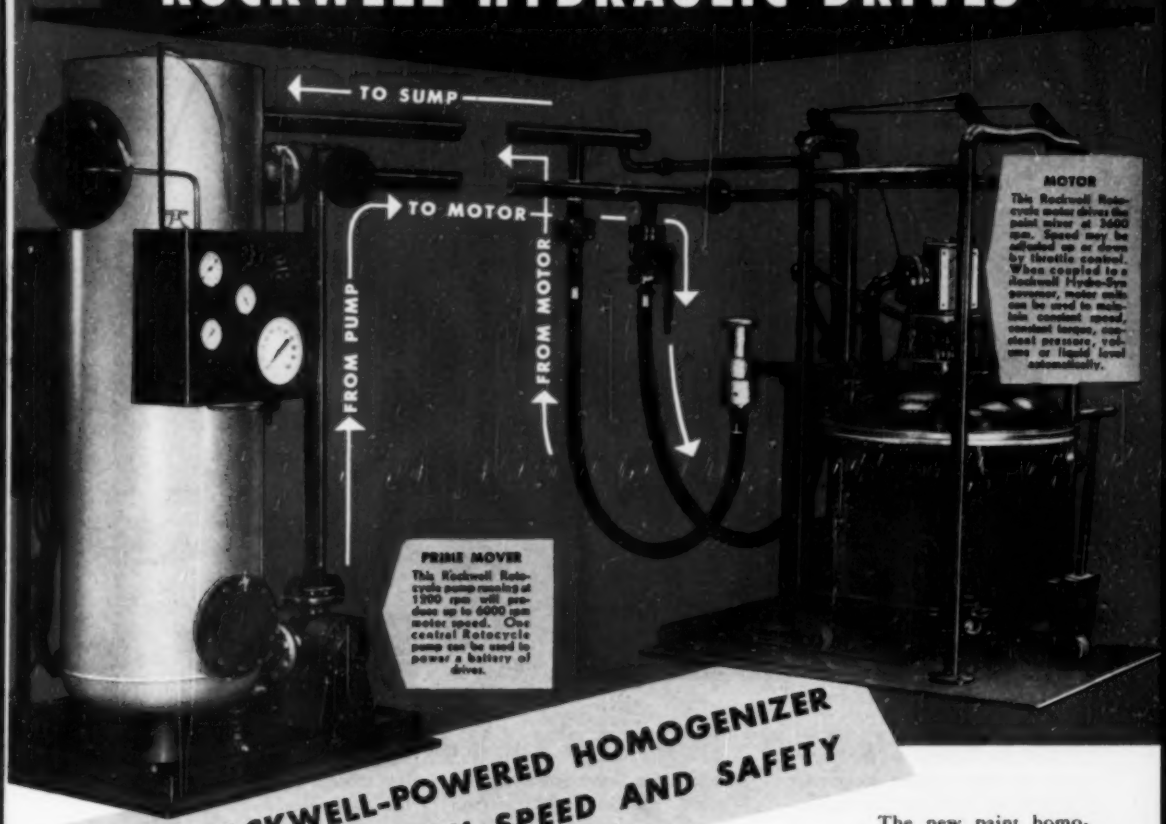
The word "Kidde" and the Kidde seal are trade-marks of Walter Kidde & Company, Inc.

Kidde

Walter Kidde & Company, Inc. • 1128 Main Street, Belleville 9, N. J.
In Canada: Walter Kidde & Company of Canada, Ltd., Montreal, P. Q.

Just one of the many applications for

ROCKWELL HYDRAULIC DRIVES


TO SUMP
TO MOTOR
FROM PUMP
FROM MOTOR
MOTOR
This Rockwell Rotocycle motor drives the paint mixer at 3600 rpm. Speed may be adjusted up or down by throttle control. When coupled to a Rockwell Hydro-Syn governor, motor will can be used to maintain constant speed, constant torque, constant pressure, volume or liquid level automatically.
PRIME MOVER
This Rockwell Rotocycle pump running at 1200 rpm will produce up to 6000 rpm motor speed. One central Rotocycle pump can be used to power a battery of drives.

NEW ROCKWELL-POWERED HOMOGENIZER MIXES PAINT WITH SPEED AND SAFETY

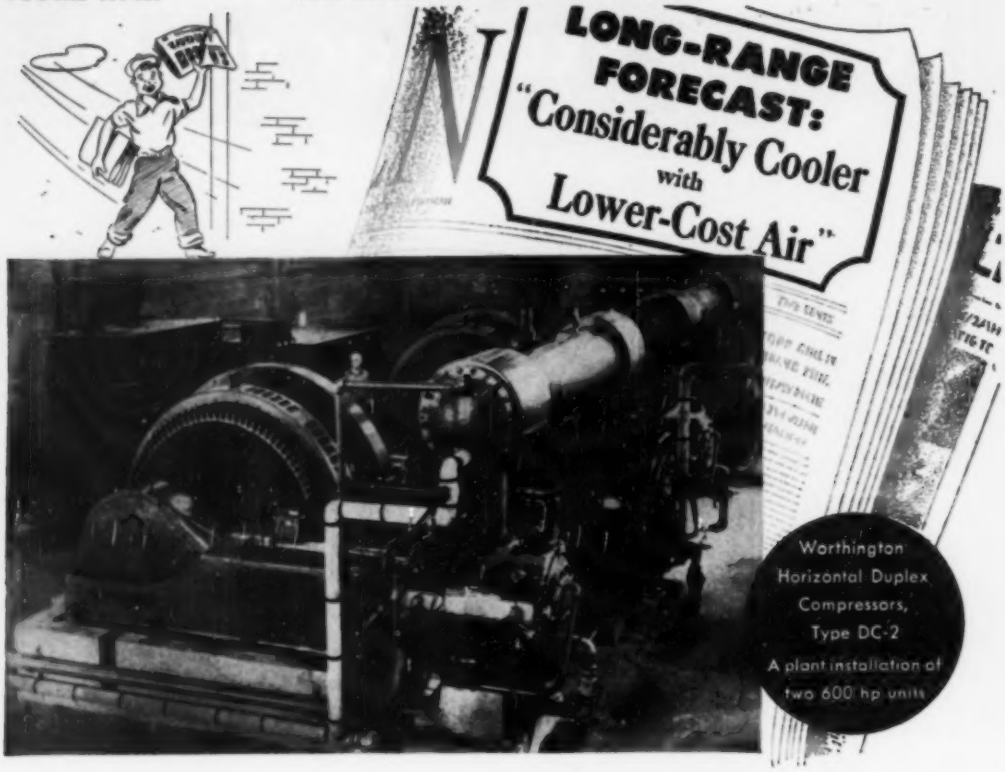
The new paint homogenizer pictured above is a development of Mead Cornell, 224 Natoma St., San Francisco 3, Calif. The rotating equipment is driven at 3600 rpm, by a Rockwell Rotocycle hydraulic system. It performs with absolute safety, since the volatile mixture is remotely located from the electric power source. This same hydraulic power can be used to drive vacuum pumps, compressors or actuating cylinders.

Due to the ability of the Rockwell hydraulic motor to maintain high torque during the acceleration cycle the time required for attaining operating speed is materially reduced—and without overload on the electrical circuit.

Rockwell has the answer to your particular problem either in hydraulic propulsion or pumping. Write today for engineering counsel on your proposed application or additional information.

Other **ENGINEERED APPLICATIONS of Rockwell Hydraulic drives include Centrifuges, Diffusers, Agitators, Extruders—in fact any service where variable speed flexibility with safety is required.**

HYDRAULICS DIVISION
ROCKWELL MANUFACTURING COMPANY
50 WATER STREET PITTSBURGH 22, PA.

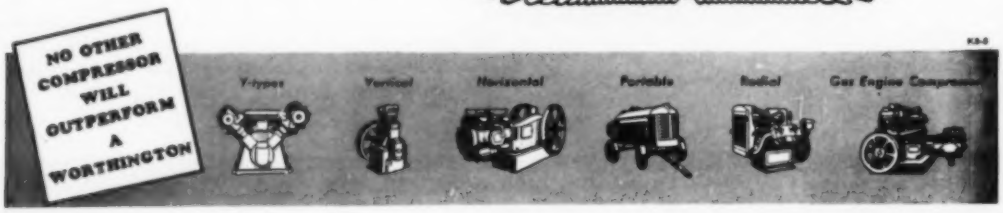

LONG-RANGE FORECAST:
"Considerably Cooler with Lower-Cost Air"
Worthington Horizontal Duplex Compressors, Type DC-2
A plant installation of two 600 hp units

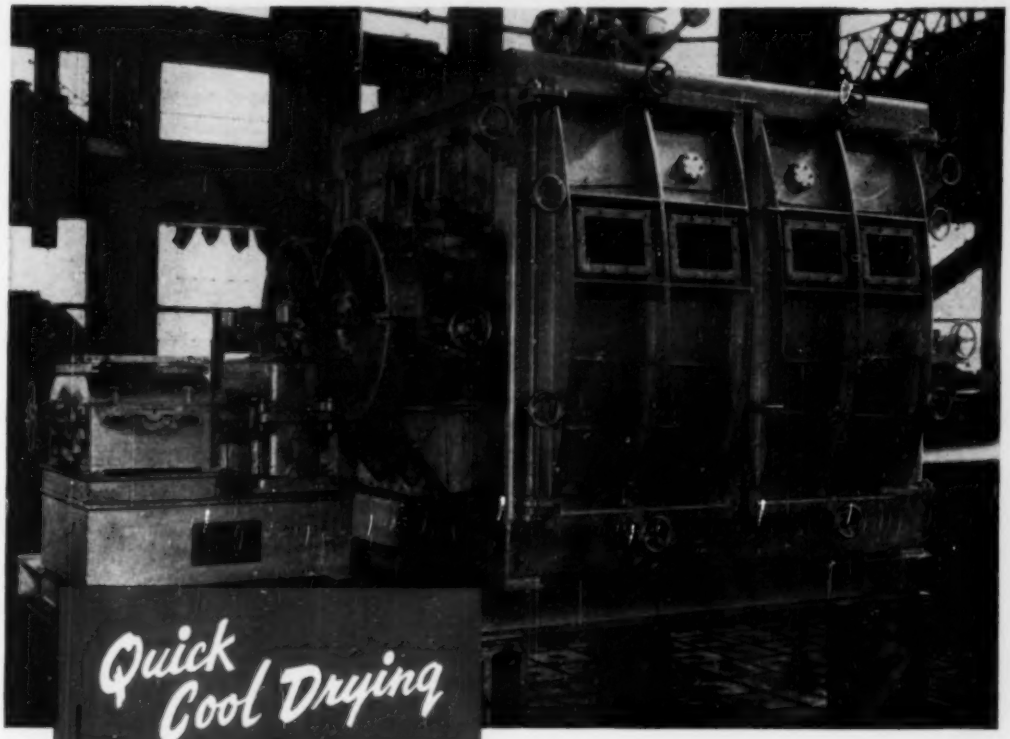
You can depend on this prediction of Worthington compressor-performance to be 100% accurate — every time! In DC-2's, for example, cooler operation is assured by such exclusive Worthington features as:

- **Advanced Variable Capacity Control** — Most modern, simple and flexible ever devised. Accurate, automatic regulation that cuts down operating heat with better lubrication and reduced carbon deposits.
- **Improved Intercooling** — High-efficiency design that provides maximum cooling with minimum water, for lower power requirements and lower operating temperatures.
- **Feather*Valves** — Lightest, tightest, most efficient ever made — a famous Worthington contribution to compressor-development.

These and many other DC-2 advantages mean not only more air for less money, but longer compressor life and constant savings in power and maintenance costs. Bulletin L-675-B1A has the complete story that proves *there's more worth in Worthington*. Write for your copy to *Worthington Pump and Machinery Corporation, Compressor Division, Buffalo, N. Y.* *REG. U. S. PAT. OFF.

WORTHINGTON





with BUFLOVAK VACUUM DRUM DRYERS

BUFLOVAK Vacuum Double Drum Dryers safely dry heat-sensitive, delicate liquid materials quickly and continuously at protective low temperatures under vacuum. The many new and exclusive features of these dryers are recent engineering developments that already have established proven performance records of outstanding operating advantages. A high quality dry product is uniformly produced in a large capacity and at low production costs. Product quality is protected by the extremely short exposure to low drying temperature. Materials are dried continuously as they enter the dryer. There is no recirculation of material or waste at the end of the run. The dryer is sanitary and accessible for thorough cleaning. Operating under vacuum also protects the product from atmospheric contamination. A uniform dry product of high quality is obtained because all of the controls are simple, accurate and positive.

BUFLOVAK Vacuum Double Drum Dryers successfully dry protein products, protein hydrolyzates, pharmaceutical extracts, soluble coffee, baby foods, corn syrup, soap to which perfume and color has been added, and a wide variety of other products.

BUFLOVAK'S long line of Processing Equipment for the Chemical and Food Processing industries includes:

DRYERS
• • •
EVAPORATORS
• • •
SOLVENT RECOVERY
and
DISTILLATION EQUIPMENT
• • •
PROCESSING KETTLES
• • •
CHEMICAL CASTINGS

•

BUFLOVAK EQUIPMENT

Division of Blaw-Knox Co.

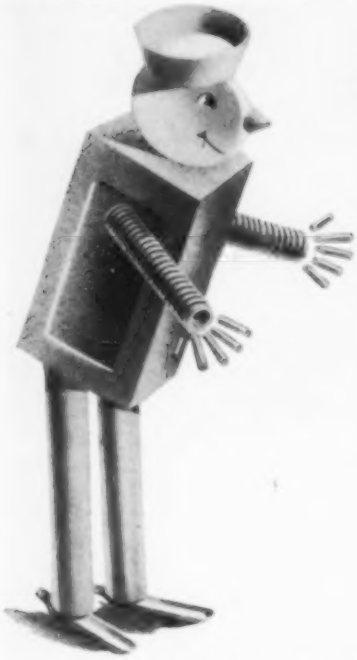
1551 FILLMORE AVE., BUFFALO 11, N. Y.

Send for New

DRUM DRYER CATALOG No. 348

48 Pages of useful information

[redacted]



Norton Company

Booth 415-416

The Chemical Show

Grand Central Palace

Nov. 28 to Dec. 3

POROUS MEDIUMS FOR COMMERCIAL PROCESSES. Uniformly porous, acid-proof, gas diffusing or filter mediums of great strength and with accurately controlled physical structure, will be exhibited in Norton Company Booth 415–416 at the Chemical Show. We invite you to visit our exhibit and talk with our engineers about these porous mediums or about our line of high temperature refractories. Norton porous mediums are made of electrically fused alumina. These mediums are chemically stable and are unaffected by the acid, neutral and slightly alkaline conditions often encountered in commercial and laboratory processes. Because of their great strength they can operate under high pressures, they are not readily chipped or broken in handling and they are extremely resistant to abrasion. Because of their refractoriness, these porous mediums when they become clogged with organic matter may be easily cleaned by burning.

See these products at the Norton Booth in the Chemical Show, or for a technical bulletin on Norton porous mediums write for our free catalog No. 140.

NORTON REFRACTORIES

NORTON COMPANY, WORCESTER 6, MASS.

Making Better Products to Make Other Products Better

aluminum protects . . .

PROTECTS DISTILLED WATER IN MANUFACTURE AND DISTRIBUTION

Aluminum storage and distribution systems for distilled, deionized or demineralized water provide protection against metallic contamination. Purity of your final product is assured. Alcoa Aluminum equipment is sturdy, corrosion resistant and easy to clean.

Distilled water equipment is but one of many chemical applications where Alcoa's Development Division helps in fabrication and alloy selection. Consult us on your chemical and petro-chemical processes. ALUMINUM COMPANY OF AMERICA, 2151L Gulf Building, Pittsburgh 19, Pennsylvania.

Visit Alcoa in Booths 70 and 71
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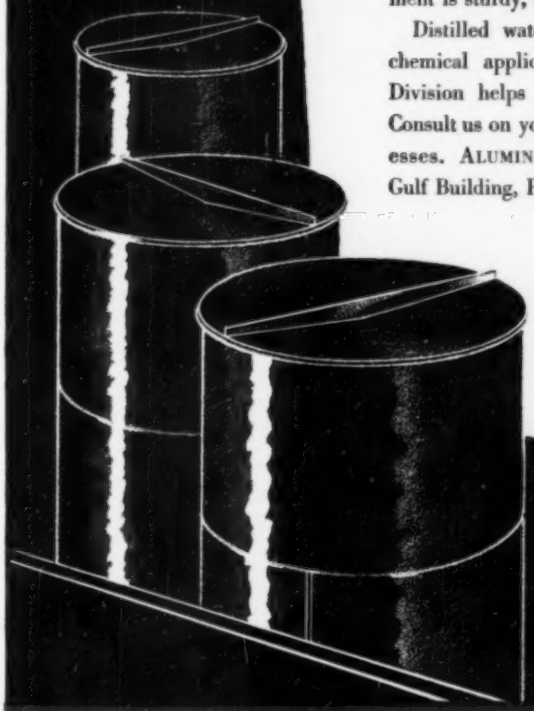

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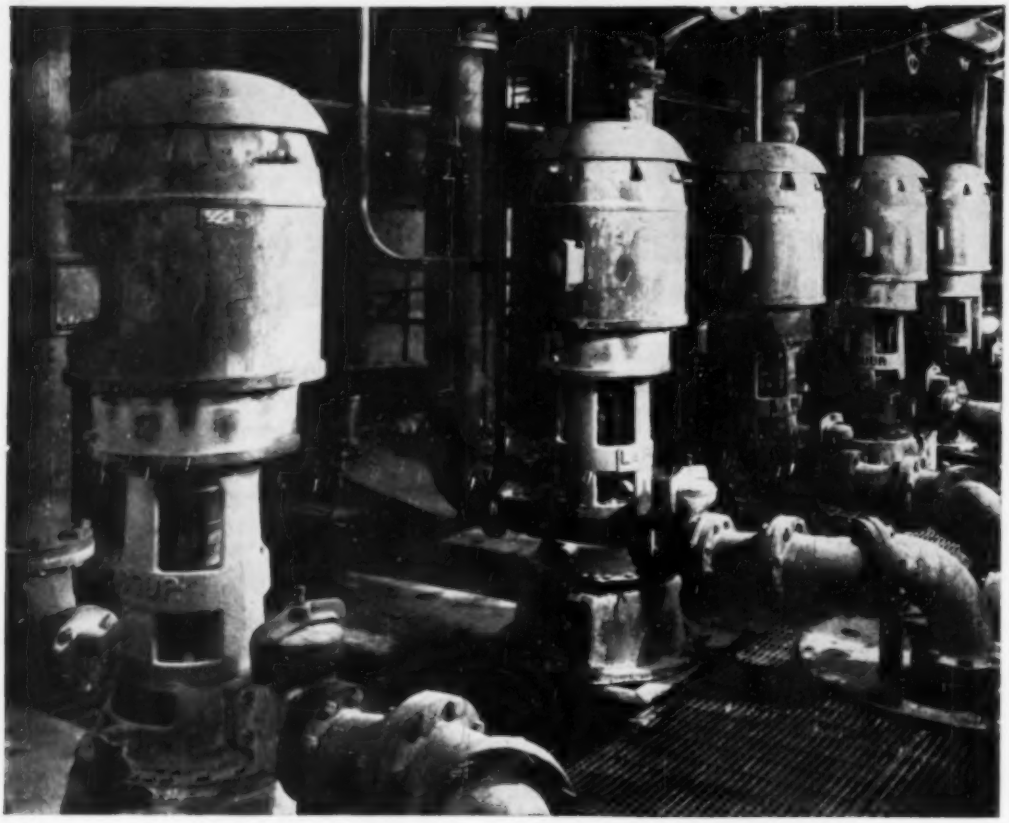


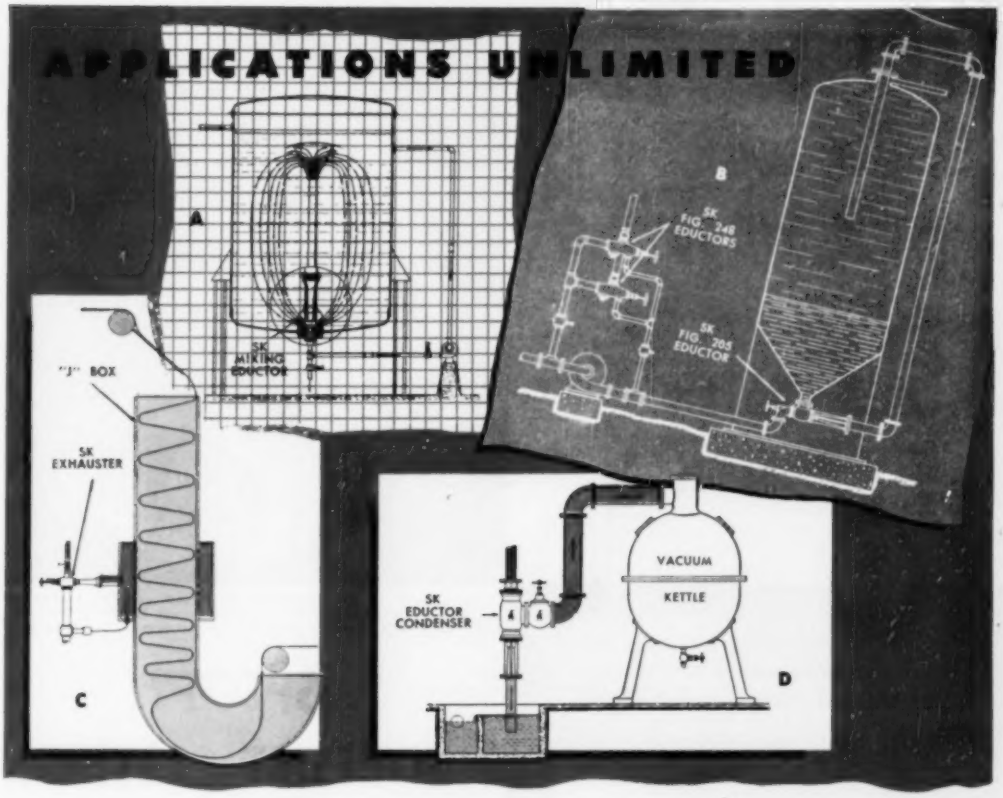
. . . and they specify LABOUR

Here are five LaBour Type G packingless self-priming pumps at work in the sulphuric acid contact system at Mathieson Chemical Corporation's Baltimore plant. The engineers who designed this installation were told to use LaBour pumps because the customer's previous experience dictated this selection.

Dependable continuity of operation is a vital factor in contact service. That's why the known reliability of LaBour pumps was the very first consideration. Second, Type G eliminates all difficulties arising from packing glands or mechanical seals because this pump has neither.

When you look at all the angles, it's easy to understand why the exacting process operations usually wind up with LaBour pumps on the job. The men responsible can't afford to take chances . . . and they specify LaBour.

THE LABOUR COMPANY, Inc. • ELKHART, INDIANA, U.S.A.



A. Mixing two corrosive liquids in a tank quickly ruined mechanical agitators and bearings in a chemical plant. An SK Fig. 258 Liquid Mixing Eductor of corrosion-resistant material now gives thorough agitation with minimum maintenance.

B. In a large Eastern refinery, this deodorization process unit utilizes three SK Jets: two SK Fig. 248 Jet Eductors mix petroleum and oxygen for process, while an SK Fig. 205 Jet Eductor with regulating spindle mixes reaction slurry and liquid and pumps mix to top of reactor.

C. A textile industry "J" Box requires uniform heating and aeration of bleached cloth. An SK Steam Jet Exhaustor entrains and mixes air and steam for uniform bleaching at a controlled temperature.

D. An SK Eductor Condenser is used in connection with a vacuum kettle in a food plant. An exceedingly simple arrangement, this installation reduced maintenance costs.

INGENIOUS engineers in all types of industry have convinced us, over the years, that the applications of SK Jet Apparatus are almost unlimited. The examples shown above are typical of a few of the problems our sales engineers have helped to solve. Other applications include pumping, mixing, blending, agitating, syphoning, scrubbing, compressing, exhausting, and many more.

As an organization offering an *engineering* as well as a *manufacturing* service, Schutte and Koerting has pioneered in the development of a wide variety of types, sizes, and constructions of Jet Apparatus. The results are a complete line of Jets for *standard* applications—and the problem-solving ability to build special equipment for *unusual* applications.

We invite you to tell us your problems involving *any* fluid medium—gases, liquids, slurries, or solid particles. Our broad experience in engineering, manufacturing, and applying Jet Apparatus may point the way to a profitable solution. Write for folder of SK Jet Apparatus catalogs.

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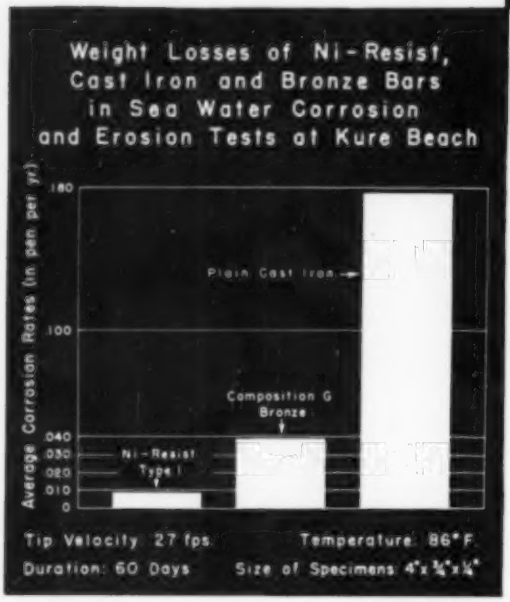
Manufacturing Engineers

1190 THOMPSON STREET • PHILADELPHIA 22, PA.

JET APPARATUS • HEAT TRANSFER EQUIPMENT • STRAINERS • CONDENSERS AND VACUUM PUMPS • OIL BURNING EQUIPMENT • ROTAMETERS • FLOW INDICATORS • RADIAFIN TUBES • VALVES • SPRAY NOZZLES AND ATOMIZERS • GEAR PUMPS • DESUPERHEATERS

HOW TO STOP WORRYING ABOUT SALT WATER CORROSION...

One of the 586-pound pump casings for Allis-Chalmers cast by Carondelet Foundry Company, St. Louis 10, Mo., a licensed producer of Ni-Resist castings for the past 15 years.



...SPECIFY NI-RESIST CASTINGS

Ni-Resist*, a nickel alloy cast iron, provides a unique combination of properties at moderate cost. This readily machinable, corrosion-resistant nickel alloyed iron lends itself to intricate casting and provides an economical solution to many corrosion problems in the process industries.

Its superiority over a good grade of cast iron and G bronze in salt water service may be gathered from the chart at the left.

For instance, Allis-Chalmers Manufacturing Company, Milwaukee 1, Wisconsin, employed Ni-Resist castings for their 10 x 10 SF pumps built to handle salt water at one of the nation's large pigment plants.

*Reg. U. S. Pat. Off.

GET FULL INFORMATION ABOUT NI-RESIST

Two booklets are yours for the asking. One describes Ni-Resist properties, and includes corrosion data on Ni-Resist and cast iron under 400 different corrosive conditions. The other booklet lists producers of Ni-Resist castings.

Don't Forget!
INCO BOOTHS
No. 9 and 10

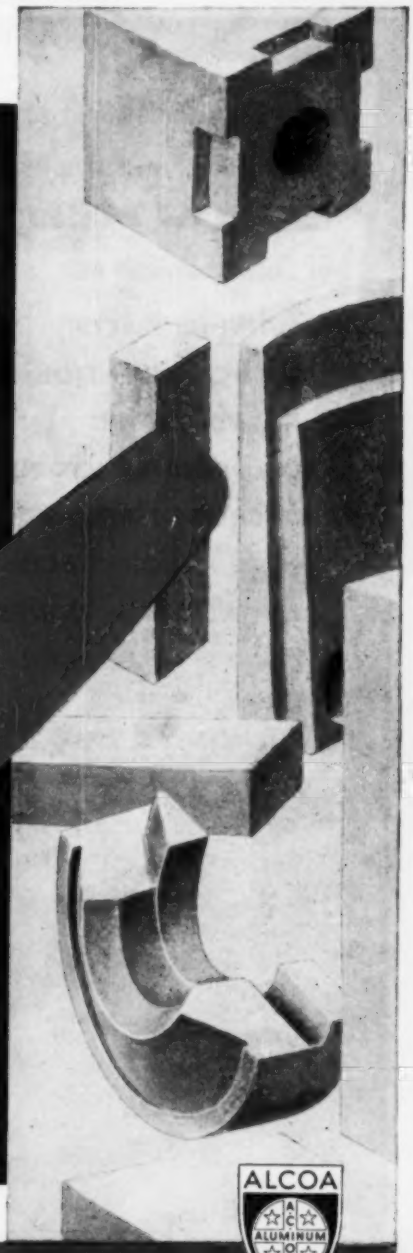
THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

Refractories fortified with ALCOA Alumina help operators increase the output of metallurgical furnaces, chemical-processing kilns, glass tanks and other high-temperature equipment. Higher operating temperatures can be sustained over longer periods . . . down time is reduced.

Even at moderate temperatures, a *little* ALCOA Alumina in refractories makes a marked difference, but the *higher the alumina content*, the *better the performance!*

Refractory-type ceramics made with ALCOA Alumina have these money-saving characteristics:

- **Strength and stability under load at high temperatures**
- **High resistance to spalling, abrasion and fluxing at high temperatures**
- **Low coefficient of expansion**
- **High resistance to thermal and mechanical shock**
- **High resistance to corrosive slags and gases**
- **Negligible porosity and shrinkage**



refractories fortified with ALCOA Alumina have extra high-temperature stability

To meet the requirements of higher operating temperatures, manufacturers are fortifying their refractory mixes with more and more ALCOA Alumina. It's a sure way of improving performance.

If you are interested in *better* refractories, let us discuss with you the data we have, concerning the value of alumina in this type of ceramics. Write to: ALUMINUM COMPANY OF AMERICA, CHEMICALS DIVISION, 1778L Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA

ALCOA CHEMICALS

ALUMINAS AND FLUORIDES

ACTIVATED ALUMINAS • CALCINED ALUMINAS • LOW SODA ALUMINAS • TABULAR ALUMINAS • HYDRATED ALUMINAS
ALUMINUM FLUORIDE • SODIUM FLUORIDE • SODIUM ACID FLUORIDE • FLUOBORIC ACID • CRYOLITE

Here's Equipment Built to Stand Up Under Your Production Requirements for **METERED PRESSURE PUMPING** of Such Chemicals as:

SULPHURIC ACID
NITRIC ACID • LIQUID CHLORINE
HYDROCHLORIC ACID • SLURRIES
CHLORINATED HYDROCARBONS
HYDROGEN PEROXIDE • PROPANE
HYDROFLUORIC ACIDS • OLEUM
CYANIDE COMPOUNDS • STYRENE
SODIUM HYDROXIDE • FREON

- NO STUFFING BOX OR RUNNING SEAL
- HYDRAULICALLY-BALANCED DIAPHRAGM SEAL
- POSITIVE DISPLACEMENT PISTON MEASUREMENT
- FLOW RATE ADJUSTABLE WHILE IN OPERATION
- OIL-BATH LUBRICATION OF ALL MOVING PARTS
- UNITS AVAILABLE FOR MANUAL OR AUTOMATIC CONTROL

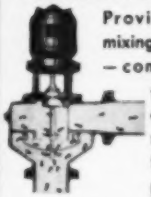
Lapp PULSAFEEDER
PISTON-DIAPHRAGM CHEMICAL PROPORTIONING PUMP

WRITE for Bulletin 262 with complete description and specifications.
LAPP INSULATOR CO., INC., PROCESS EQUIPMENT DIVISION, 100 MAPLE STREET, LEROY, N. Y.

MIXING HEADQUARTERS

NETTCO

NETTCO FLOMIX (PATENTED)



Provides continuous mixing in the pipe line — combines liquids, gases and liquids, and liquids and solids that will flow through pipe lines.

NETTCO AGITATORS

A wide range of complete units with fully enclosed agitator drive, motor, turbine stirrer, and tank.

NETTCO DUPLEX DRIVE

Rotates two sets of blades in opposite directions for complex and highly efficient mixing.

NETTCO *Low Speed* GEAR DRIVE

For low speeds and large tanks, Model TAB Drive provides gear ratios as low as one to two thousand.

The line of NETTCO Agitating Equipment is complete — our engineers will gladly make recommendations to meet your requirements.

NEW ENGLAND TANK & TOWER CO.
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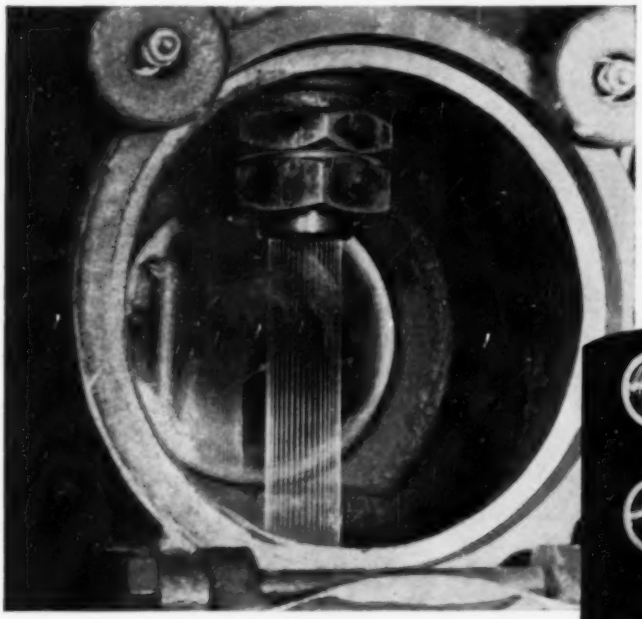
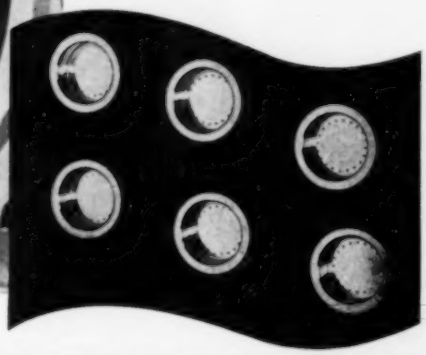
STAINLESS STEEL SPINNERETTES extrude a liquid synthetic which solidifies into fine, water-resistant yarn the instant it meets a stream of hot air. As loose rust and scale might plug tiny spinnerette holes, causing yarn imperfections, stainless steel's corrosion-resistance and ease of cleaning are vital. Stainless steel also protects yarn color and color stability against metallic-contamination effects. In its journey to spinnerettes, liquid "dope" travels through pipes, mixers, tanks of corrosion-resistant stainless steel.

Enduro-THRIFTY METAL OF 10,000 USES





CORROSION EXCLUDED WHERE YARN IS EXTRUDED

Republic ENDURO Stainless Steel—important member of the useful steel group known as "corrosion-resistant alloys"—stubbornly and effectively *resists rust and corrosion.* Chemical process equipment made of it resists the action of most acids and alkalies . . . of hot gases and superheated steam. Result: product-contacting ENDURO surfaces stay clean, smooth and unpitted. They offer no foothold for the accumulation of dirt or other contaminating substances. They discourage the build-up of corrosion products which might foul the equipment, the system or the product.

With corrosion—and corrosion products—forestalled, production moves steadily, with fewer shutdowns for periodic cleanouts or replacements. Equipment life is lengthened substantially. Maintenance costs plunge to record low levels. Thus, you pay no financial penalty for *all* of ENDURO's many advantages—in fact, you save.

Included among the broad range of ENDURO analysis are Stainless and Heat Resisting Steels developed to solve a wide variety of corrosion and high temperature problems. For more detailed information—interesting facts and figures—or for metallurgical assistance, just write:

REPUBLIC STEEL CORPORATION

Alloy Steel Division • Massillon, Ohio

GENERAL OFFICES • CLEVELAND 1, OHIO

Export Department: Chrysler Building, New York 17, N. Y.

Enduro **STAINLESS STEEL**

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REPUBLIC STEEL

✓ **Check ALL 10 Advantages:** • RUST AND CORROSION-RESISTANCE • HEAT-RESISTANCE • HIGH STRENGTH • NO METALLIC CONTAMINATION • SANITARY SURFACES • EASY TO CLEAN • EYE APPEAL • EASY TO FABRICATE • LONG LIFE • LOW END COST.

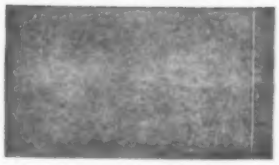
BOOTHS 40-41

22nd EXPOSITION CHEMICAL INDUSTRIES

KNOCK-OUT

BULLETIN 2022 ▶

"Brown Flow Meters for Cost Accounting," is complete and informative. A copy will be sent to you upon request. Write today!



22nd EXPOSITION CHEMICAL INDUSTRIES BOOTHS 40-41

STEAM WASTE

with Brown Flow Accounting Meters

Your costs for distribution and utilization of steam (or other fluid) will be known facts with the installation of Brown Flow Accounting Meters. Hourly and daily records from your Brown Flow Meters will enable you to know, not approximate, what is happening . . . where it is happening . . . when it is happening. You can deal a knock-out blow to waste and properly pro-rate expenses for each operation and each department. The Brown Flow Accounting System is producing sensational economies in many plants, repaying the original investment in a very short time.

Check, today, on the application of Brown Flow Accounting Meters to your processes! You can get detailed information in Bulletin 2022 . . . send for your copy!

Brown Recording Integrating Flow Meters are not expensive! For example, a complete unit for a six inch steam line costs less than $500.00!

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BROWN INSTRUMENTS DIVISION
4478 Wayne Ave., Philadelphia 44, Pa.
Offices in principal cities of the United States, Canada and throughout the world

BROWN *Advanced Instrumentation* FOR THE CHEMICAL INDUSTRY
Product of Minneapolis Honeywell

In this day of upward spiraling operation costs, there's one man who can effect production economies. He's the man whose responsibility is getting the most heat and power from each fuel dollar expended. He knows that you get maximum efficiency from Eagle-Picher Industrial Insulations — because they're durable, chemically and physically stable, water-repellent *mineral wool*. They give long years of service, and are easy to maintain, economical to replace. There's an Eagle-Picher Insulation that can help reduce *your* operating expenses!

Let these Eagle-Picher products save you money . . . power . . . time

Insulating Felts
Supertemp Block • Blankets
Loose Wool • Pipe Covering
Stalastic • Insulseal • Insulstic
Swetchek • Finishing Cements
Insulating Cements

THE EAGLE-PICHER COMPANY

General Offices: Cincinnati (1), Ohio

Insulation products of efficient mineral wool—for a full range of high and low temperatures. Technical data on request.

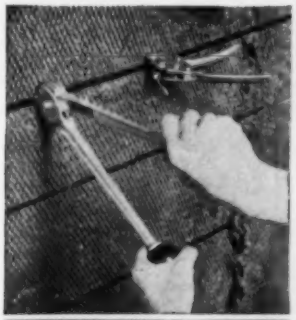
EAGLE EP PICHER *Since 1843*

The perfect answer

FOR MAXIMUM FUEL SAVINGS AND EXACT TEMPERATURE CONTROL

For a completely effective, low-cost insulation combination, you can't beat the teamwork of Eagle-Picher Mineral Wool Blankets, Supertemp Blocks, Super "66" Cement and Insulseal. They work effectively to give your equipment higher efficiency . . . cut operating costs . . . and help to provide perfect, precise control over temperatures.

Visit Booths 678 and 679 at the Chemical Show in New York November 28 to December 3



EAGLE-PICHER MINERAL WOOL BLANKETS

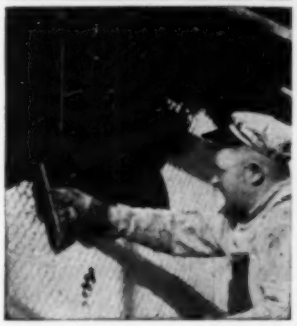
These blankets satisfy the need for a convenient method of quickly and efficiently insulating flat or curved surfaces on larger types of heated equipment. Mineral wool is felted and secured between flexible metal fabric. Outstanding physical and chemical stability enable Eagle-Picher Blankets to resist water, steam, corrosive fumes and normal vibration.

EAGLE-PICHER SUPERTEMP BLOCKS

Eagle-Picher Supertemp Blocks are lightweight (approximately 16 lbs. per cu. ft.). Can be cut easily with knife or saw to fit off-shaped areas . . . they fit snugly over minor irregularities. They're strong and have high refractory value. Withstand temperatures up to 1700 F. Conductivity at 512 F. approximately 0.43...all standard sizes, from 3" x 18" to 12" x 36" ...in thicknesses from 1" to 4".

EAGLE-PICHER SUPER "66" INSULATING CEMENT

Super "66" is all-purpose, rust-inhibitive, extremely adhesive insulating cement. "Springy ball" pellets don't collapse after application . . . give great coverage, retain their thermal efficiency. 100 lbs. covers 65 sq. ft. —1 inch thick! Easily applied with trowel, over flat and irregular surfaces. Efficient for temperatures up to 1800 F. Reclaimable when used on equipment whose temperatures go up to 1200 F.!



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A tough, weatherproof, protective coating for insulation. For temperatures up to 450 F. Applied as a plastic, its smooth troweling qualities assure uniform coverage, proper thickness. It protects insulation from air infiltration, fumes, rain, snow, vibration, punctures, and withstands severe service, indoors or out. Dries to a smooth, rich black, has a neat appearance on hot or cold surfaces . . . may be washed or painted.

THE EAGLE-PICHER COMPANY *General Offices: Cincinnati (1), Ohio*

Insulation products of efficient mineral wool—for a full range of high and low temperatures. Technical data on request.

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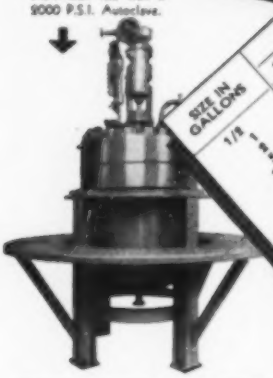
Since 1843

AUTOCLAVES

STANDARD SIZES AND PRESSURES FOR AUTOCLAVES AND KETTLES

SIZE IN GALLONS	PRESSURE IN P.S.I. 15	100	250	600	1000	1500	2500	3500	5000
1/8									
1/4									
1/2									
1									
2									
3									
5									
7½									
10									
15									
20									
30									
50									
75									
100									
150									
200									
300									
500									

Blaw-Knox 125 Gal. x 9000 P.S.I. Autoclave.



Blaw-Knox High-Pressure Autoclave with Quick-Opening Closure.

CONSTRUCTION FEATURES

- Advanced Welding Techniques.
- Thorough Testing and Inspection.
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- Built for Maximum Safety.

DESIGN FEATURES

- Efficient Agitation.
- Quick Heating and Precise Control.
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- Leak-Proof Stuffing-Boxes.

BLAW-KNOX

DIVISION OF BLAW-KNOX COMPANY

2090 Farmers Bank Building, Pittsburgh 22, Pa.

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The next time you have a drive problem—

Rotary drier driven by Jones Herringbone Speed Reducer.

WHEN you have a drive problem that calls for a speed reducer, don't overlook Jones. All that we ask is an opportunity to present the features of Jones Herringbone, Worm and Spur Speed Reducers that have caused them to be selected for so many applications in process plants. The accompanying illustrations are typical of the Jones drives that are to be found in a wide variety of chemical plants, paper mills, paint, varnish, and plastics plants, and a host of similar applications.

Before you decide on your next speed reducers, we shall appreciate the opportunity of assisting you in the selection of drives to meet your specific requirements.

W. A. JONES FOUNDRY & MACHINE CO.
4415 Roosevelt Road, Chicago, Illinois

Vertical agitator driven through Jones double reduction Herringbone Reducer.

Jones Herringbone Reducer driving ball mill.

CATALOG NO. 70 —Both standard and special applications of Herringbone Reducers are covered in this new catalog with technical information on applications.

BULLETIN NO. 75—Jones Worm-Helical Speed Reducers for vertical shaft drives, with rating tables, dimension diagrams, torque charts etc.

Copies will be sent on request.

Vertical agitator driven by Jones Worm-Helical Speed Reducer.

Jones

HERRINGBONE—WORM—SPUR—GEAR SPEED REDUCERS • PULLEYS
CUT AND MOLDED TOOTH GEARS • V-BELT SHEAVES • ANTI-FRICTION
PILLOW BLOCKS • FRICTION CLUTCHES • TRANSMISSION APPLIANCES

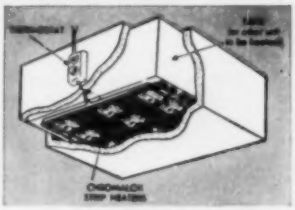
22nd EXPOSITION CHEMICAL INDUSTRIES BOOTH 601

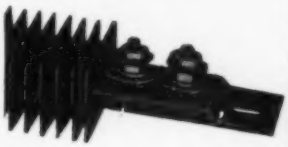
CHROMALOX offers you efficient and economical *Packaged Electric Heat*—to fit your specific needs

CHROMALOX Electric Heaters give dependable "on-the-spot" heat where and when heat is needed. They produce uniform and accurate temperatures with automatic or manual control. *Low* initial cost, *low* installation cost and *low* operating costs are among the other advantages they give you.

CHROMALOX STRIP HEATERS

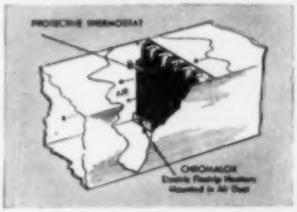
Easy-to-install CHROMALOX Strip Heaters are clamped to flat or curved surfaces, round vats, pipes and tubes. They are made in straight lengths, rings and segments . . . and may be curved or bent to fit cylindrical or "dished" surfaces. Typical applications include: armatures, cleaning tanks, molds, process kettles, plating baths, revolving rolls, etc.

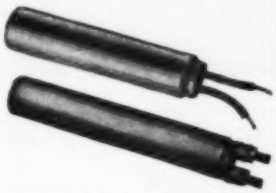




CHROMALOX FINSTRIP HEATERS

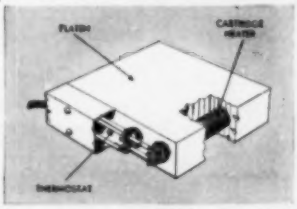
Finstrip Heaters are used for drying, curing, space heating and other applications requiring heated air under forced circulation. Air and gases are quickly and easily heated; uniform operating temperatures up to 750°F. are accurately maintained by thermostatic control. Finstrips, designed for minimum turbulence, are well suited for use in air-ducts.

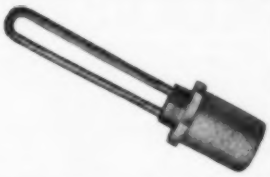




CHROMALOX CARTRIDGE HEATERS

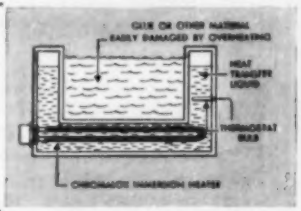
Compact CHROMALOX Cartridge Heaters are ideal for use when concentrated heat is needed. Inserted into close-fitting holes, they provide easily controlled heat for dies, molds, platens, etc. They are quickly and easily installed in stationary or moving parts with minimum labor and material costs; they may be controlled for accurate, dependable, care-free operation.





CHROMALOX IMMERSION HEATERS

CHROMALOX Immersion Heaters are used in degreasing, cleaning, pickling and plating baths; for melting greases, asphalts and similar viscous fluids; for heating Dowtherm, Arochlor, Prestone, and other heat-transfer mediums. Available in many sizes and types, with alloy sheaths to resist corrosive action.



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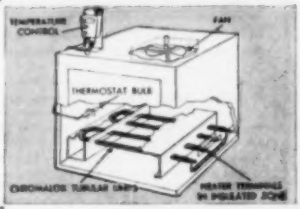

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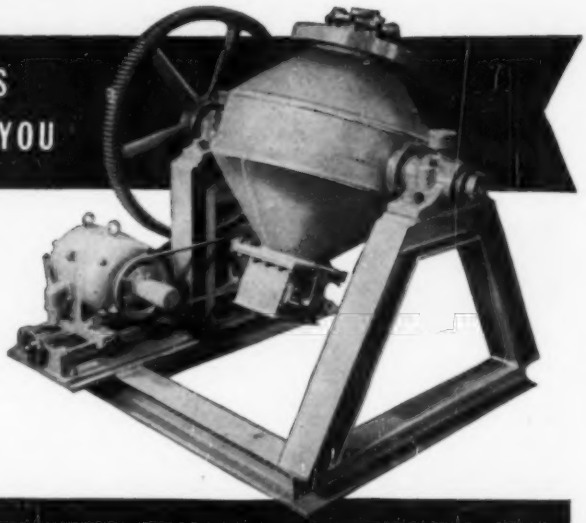

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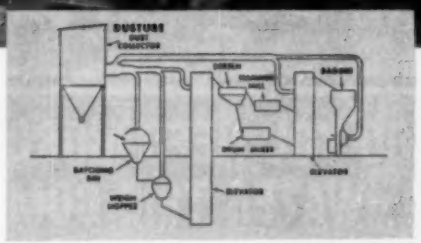

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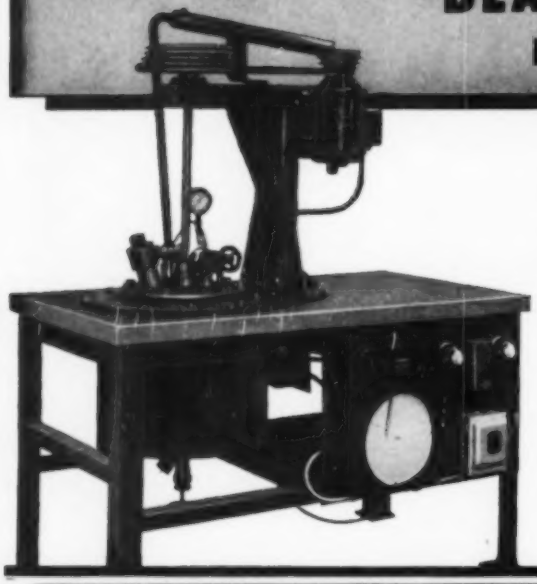

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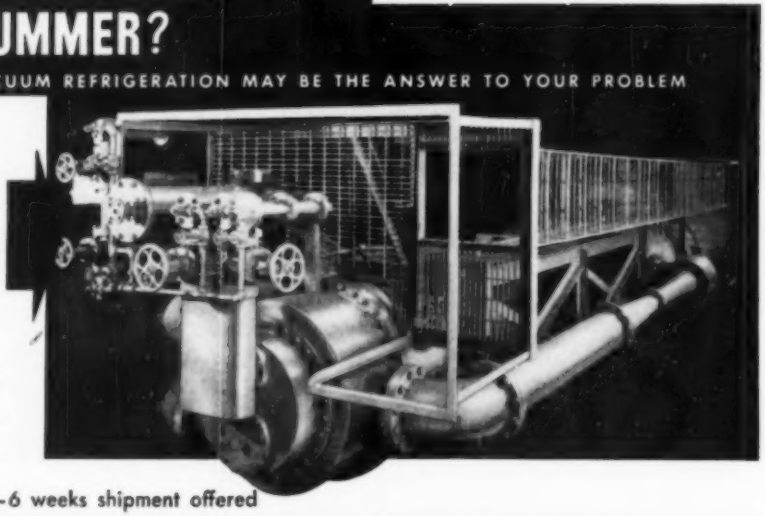

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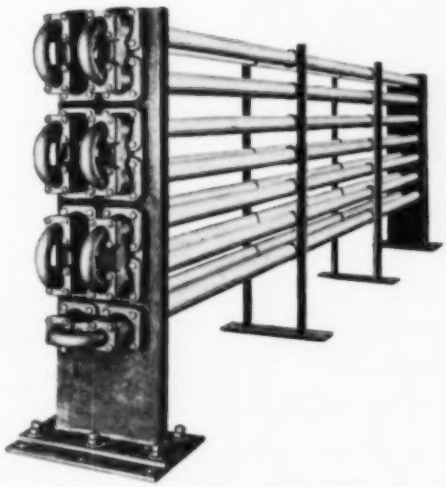

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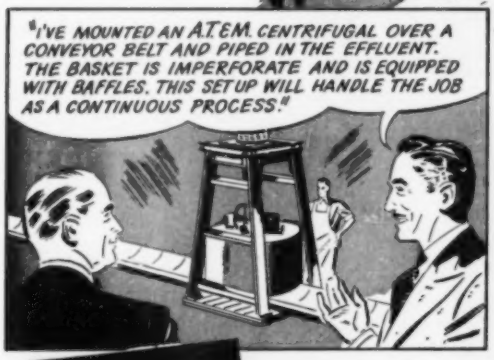
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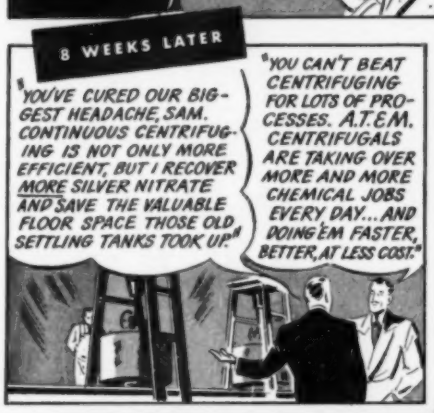
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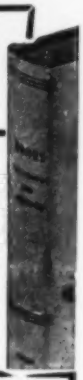

ODORS: PHYSIOLOGY AND CONTROL summarizes all advanced knowledge of odors and offers a unique theory of odor elimination. It provides extensive information on a variety of measures for the elimination of odors in food, in industry, in the home, and on the person. You're shown the methods being used to combat and eliminate odors, together with many other theories and little known facts about them.

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and Wm. N. Witheridge,
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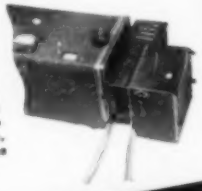

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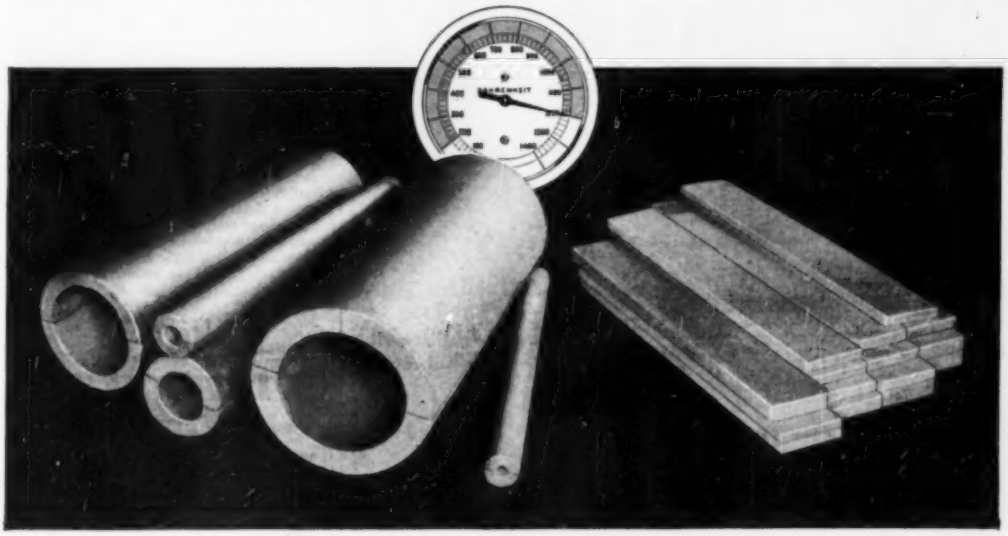

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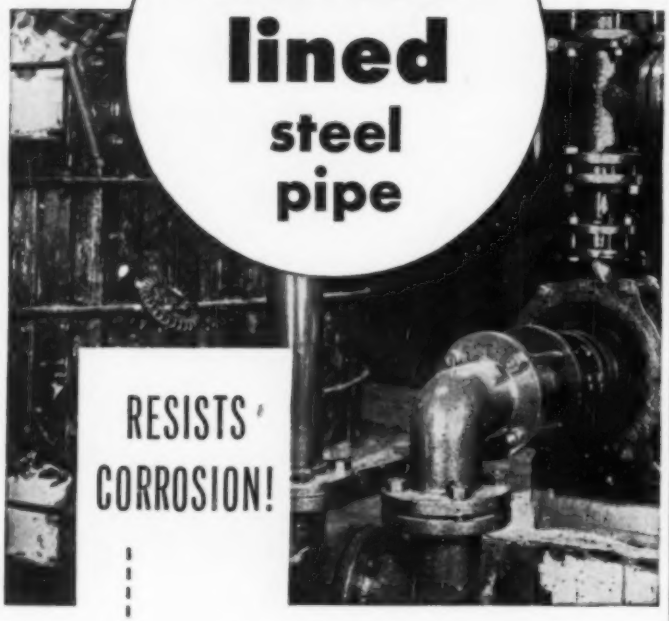

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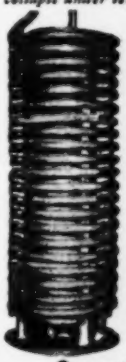

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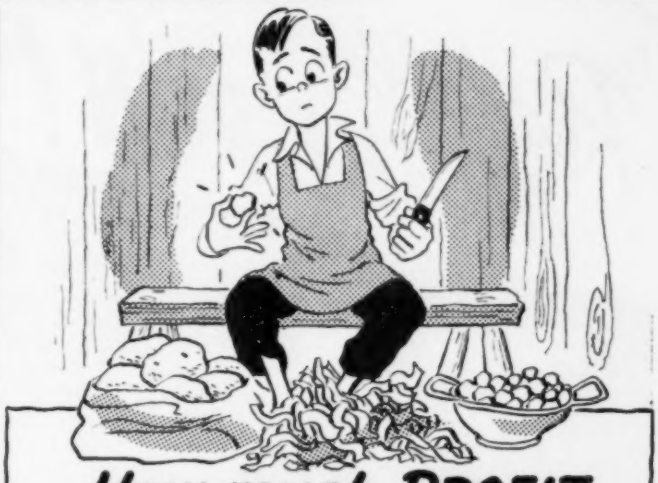

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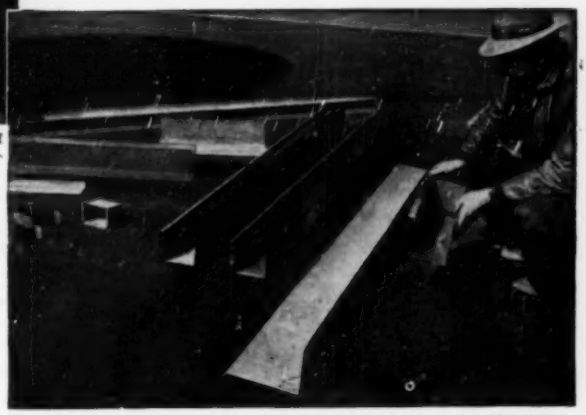

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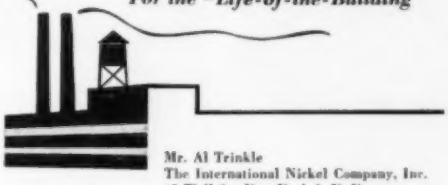

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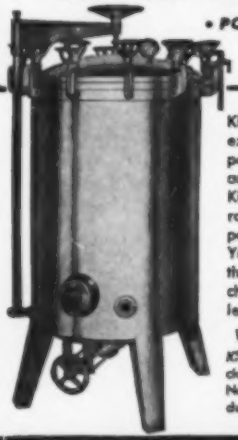

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If you want automatic low-cost protection against tramp iron hazards, consult *Stearns Magnetic* — our engineers have the know-how and experience to solve your problem.

Years of research and development by Stearns engineers have produced an outstanding product in magnetic pulleys — the reason for their wide acceptance in all industries for removing tramp iron, for separation and reclamation of materials.

For complete specifications and operating data on Stearns Electro and Permanent Magnetic Pulleys and Pulley Separators, write for Bulletins 303 & 350.

Electro and Permanent Magnetic Pulleys and Pulley Separators to fit your needs.

Stearns MAGNETIC MANUFACTURING CO.
6295 28th St., Milwaukee 4, Wisc.

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The advertising is a rich source of valuable information. In this magazine it offers you ideas and products that may well apply advantageously to your business.

Every issue is a catalog of goods, materials, and services — quickly available to you – just for the reading.

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When you read all the ads in this magazine, the chances are good that you'll get a lead that will materially help you do a better job. For example, you may find a specific piece of equipment that will be a profitable time-saver. Or a tool that will increase worker efficiency. That's why it pays to read the advertising. It's good business.

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McGRAW-HILL publications

F-25

SEARCHLIGHT SECTION

used and surplus new

CHEMICAL
AND CHEMICAL PROCESSING
EQUIPMENT
POWER • SHOP • PLANT

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OPPORTUNITY UNLIMITED...

"Always building, never built", the Chemical industries are going full speed ahead into a fresh period of growth, of expansion, that opens new horizons of opportunity to the young men of America.

Today the process industries account for more than one-fifth of all capital expenditures. Five years from now, it is predicted, they will account for at least one-third of the total.

While other industries are placing emphasis on replacement and modernization, the process industries, ever young, ever ambitious, are planning to keep on expanding at a high level.

Or in other, simpler words, there's no limit to the way new business is going to build better and bigger things for better living, through chemistry...

...and there's no limit to the possibilities of future success of the thousands of young men in the country in the chemical industries, who are planning now to "go into business for themselves."

In inorganic chemical engineering there is OPPORTUNITY UNLIMITED.....fluorine, phosphorus, titanium and other rare metals are opening new worlds of industrial application.

So too in the field of petrochemical engineering - pushing coal tar into the background as raw material for thousands of synthetics, including PLASTICS now made at the rate of a billion and a half pounds a year.....OPPORTUNITY UNLIMITED!.....with the demand still growing, the end not yet glimpsed!

It is you young men starting in business today who have so big a mortgage on the future. The new independent businesses starting now are the seeds of continuing leadership of America tomorrow.

To you young men who are going into business for yourselves today, "CONSOLIDATED", proudly offers the same helping hand it has been extending so successfully to growing industries for the past 30 years.

Today on the Exchange you will find listed the names of many big companies which were once small.....who had to count every penny when buying processing machinery...

...and who turned to "CONSOLIDATED" to help them economize, to help them get what they needed to get started, perhaps on a "shoestring."

To such men "CONSOLIDATED" offers the results of over a generation of cumulative experience in properly selecting used process machinery and equipment, in rebuilding it so it will serve long and well, under a GUARANTEE that really means something.

Men now grown grey in the chemical industries, who have helped build America, know how "CONSOLIDATED" has helped and will continue to help "the little fellows."

They know that "CONSOLIDATED" has been an integral part of the growth of this great industry "from small beginnings."

Right now there are ambitious young men everywhere in this land, just out of college, or working for someone else, who have ideas and plans, who are dreaming dreams of better methods and products, whose goal is their own independent business, and who realize that NOW is the time to begin.

AND WHAT A PROSPECT STRETCHES BEFORE THEM!

There is OPPORTUNITY UNLIMITED for young men in the field of the new sulfa drugs, for instance - streptomycin, penicillin, auramycin, cloromycetin - work has just started in this, one of the most rapidly growing branches of the chemical industry.

There is OPPORTUNITY UNLIMITED in putting chemistry to work in agriculture.....new insecticides, fungicides, plant hormones, are causing a veritable revolution in this field.

CONSOLIDATED
HELPING HAND OF INDUSTRY

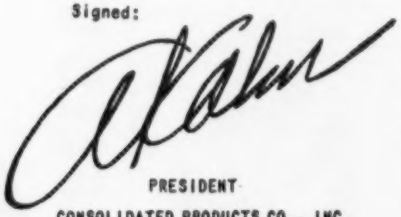
And today, as in the past, "CONSOLIDATED" is proud of the part we have in making it possible for such young men to get together, economically, rapidly, and confidently, the machinery and equipment to grasp these golden opportunities, to turn their plans into profitable realities.

Your equipment problems of saving money and saving time belong on our experienced shoulders. Perhaps your budget is low..... Perhaps you cannot afford to wait for months for needed equipment.

"CONSOLIDATED" can and will work with you to supply what you want, when you want it, at a price you can afford to pay.

And they know how "CONSOLIDATED" service will continue to be of invaluable assistance to the man who wants to buy, with confidence, the equipment for the business he has started with confidence in his own abilities and in the great future of America.....OPPORTUNITY UNLIMITED!

Signed:



PRESIDENT
CONSOLIDATED PRODUCTS CO., INC.

"CONSOLIDATED" is indebted to a study made by the editors of McGraw-Hill on the future of the Chemical Industry for the facts and figures quoted in this message.

During the Chemical Exposition
Nov. 28-Dec. 3, 1949
the entire Staff of
"CONSOLIDATED"

invites old friends and future prospects to be our guests at the Hotel Lexington, Suite 1402-3, just across the street from the Grand Central Palace.

This year, your registration at our "OPEN HOUSE" makes you eligible to win our Daily Door Prize.

CONSOLIDATED PRODUCTS CO., Inc.

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WELCOME!—
says the
GELB GIRL

We welcome all visitors to the **"CHEMICAL SHOW"**— *Will be looking for you with a cheerful welcome at the* **BELMONT PLAZA** *(across the street)-we will be glad to see old friends and welcome new ones.*

THE "22nd EXPOSITION" GELB GIRL **R.**

—and now take a look at these

GELB VALUES ... *a "SHOW" in themselves for Quality and Economy*

FILTER PRESSES

1—Sperry 24" Stainless Steel Filter Press, Closed Delivery, 12 chambers with hydraulic closing.
1—Sperry Stainless Steel Filter Press, 12" x 12", 15 chambers.
1—Shriver 42" x 42" Filter Press, 46 chambers with hydraulic closing.
1—Shriver 36" x 36" Filter Press, closed delivery.
1—Sperry Plate & Frame Aluminum Filter Press, 18" x 18".
1—Shriver Bronze plate and frame Filter Press, 18" x 18".
2—Sweetland #5 Stainless Steel Felters (New).
1—Vallez #3 Filter.
1—Sperry Rubber-lined Filter Press, 12" x 12", closed delivery, plate and frame.
1—Shriver 42" Skeleton.
1—Sparkler Filter, Model 18-D-8.
4—Shriver Plate and Frame Lab. Filter Presses, 7" x 7".

MIXERS

1—Banbury Mixer #1 with 50 HP Motor.
4—Baker Perkins Jacketed Vacuum Type Double Arm Mixers, w/motors and drives, 600# capacity.
3—Cavagnarro Vacuum type Double-arm Mixers w/motors and drives, 600# capacity.
1—J. H. Day double arm, jacketed Mixer, sigma blades, 500 gallons.
3—J. H. Day double arm, jacketed Mixers, 50 gals., sigma blades.
1—Baker Perkins double arm jacketed Mixer, 200 gals., sigma blades.
5—Baker Perkins double arm Mixers, 200 gals., sigma blades.
1—J. H. Day Mogul type Mixer, 5 gallons.
5—Simpson #0 Intensive Mixers.
1—Baker Perkins jacketed lab. Mixer, Size 6, Stainless Steel.
1—J. H. Day Lab. Type Mixer.
1—Patterson nickel lined Blender, 192 cu. ft. cap., w/20 HP Motor.

CENTRIFUGES

1—Bird Suspended type Centrifuge, 40" Stainless Steel perforated basket with motor.
1—Tolhurst Suspended type Centrifuge, 40" rubber perforated basket, with motor.

CENTRIFUGES—Cont'd

1—Tolhurst solid curb centrifuge, 20" rubber basket, with motor.
1—Podbielniak Stainless Steel Centrifugal Extractor, Model 4080.
10—Sharples Super Pressurite Centrifuge, with 3 HP Expl. proof motors.
1—Sharples Super Pressurite Centrifuge, Stainless Steel Bowl, Model 18 V.

MILLS

1—Royle #1 Perfected Extruder, with heating unit.
1—Allis Chalmers Ball Mill, 5'8" x 18', Silex lined.
3—Hardinge Conical Ball Mills, 8' x 30", 5' x 22", 6' x 22".

KETTLES & TANKS

1—Kettle 300 gallons, with Mixer (ASME).
1—Plate Fabricator, jacketed kettle, 900 gallons, 125 PSI (ASME).
1—Steel Jacketed Kettle, 7'3" x 7'.
1—Cast Iron Jacketed Kettle, 300 gallons.
1—Pfaudler 60 gallon glass lined reactor, with agitator and glass lined condenser.
1—Pfaudler aluminum jacketed Reactor with agitator, 1300 gallons (New).
1—Pfaudler aluminum jacketed Reactor with agitator, 250 gallons (New).
2—Pfaudler 500 gallon glass lined sotrage tanks (Horizontal).
1—Buffalo Cast Iron Jacketed Kettle, 600 gallons, with mixer.
1—Blaw-Knox Jacketed Autoclave, 3' x 4'2", with agitator.
2—Rubber-lined Storage Tanks, 7,800 gallons.
1—Steel Storage Tank, 16,000 gallons.
1—Nickel Jacketed Still, 4' x 5'.
2—Alloy Fabricators, S.S. jacketed Reaction Kettles, 170 gallons with agitator and motor.
1—Alloy Fabricators Stainless Steel Jacketed Reaction Kettle, with stainless steel condenser, 170 gallons, with agitator and motor.
1—Stainless Steel Direct Fired Still, 6" x 6", with coils and agitator.
5—Monel Storage Tanks, 1800 gallons.
1—Steel Storage Tank, 10,000 gallons, 1" plate.
2—Steel Pressure Tanks, 4' x 11', 200 PSI.

DRYERS

2—Black & Clawson Double Drum Dryers, 28" x 5'
3—Louisville Rotary Steam Tube Dryers, 6' x 50'.
1—Louisville Rotary Steam Tube Dryer, 54" x 30'.
2—Buffalo Double Door Vacuum Shelf Dryers, 12 & 14 shelves.
1—Buffalo Single Door Vacuum Shelf Dryer, 17 shelves.
1—Bartlett & Snow direct fired Kiln, 8½' x 50'.
1—Ruggles Cole direct fired Kiln, 7' x 60'.
3—Buffalo Flakers, 5' x 12'.
1—Buffalo Double Drum Dryer, 36" x 72", chrome plated drums.

MISCELLANEOUS

1—#5 Mikro Atomizer, Stainless Steel, w/20 HP Motor.
1—Fuller Air Compressor, Model #300.
1—Mikro Pulverizer, #2TH.
1—Mikro Pulverizer, #1SH.
1—Fitzpatrick Style D Comminuting Machine.
1—Ball & Jewell Rotary Cutter, #½.
1—Ball & Jewell Rotary Cutter, #2.

SOMETHING YOU SHOULDN'T FORGET

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BELMONT PLAZA

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CHEMICAL, RUBBER, OIL, PLASTIC and FOOD PROCESSING MACHINERY
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SELECTED REBUILT AND GUARANTEED BY ENGINEERS

EMSCO

AGITATOR DRIVES

1187 1—7½ H.P. 220/440 V, 60 cycle, 3 phase, totally enclosed fan cooled vertical motor with integrally built speed reducer at 5.2 R.P.M.

1752 1—C. W. Phila Gear Vertical motor reducer outfit. Motor rated 10 H.P. 1750 R.P.M. 220/440 V. 60 cycle, 3 phase, T.E.F.C. Reducer output speed 425 R.P.M.

1764 2—W. A. Jones 14V Horizontal/Vertical Reducer driven, 104 to 1 ratio input shaft 1⅝" D. Output shaft 2⅝" D.

AUTOCLAVES

680 1—42" D x 24'4" vertical forge welded steel, 600 lbs. pressure, 1,300 gallons.

1153 1—10'x25' vertical or horizontal forge welded steel jacketed, 100 lbs. pressure. Can be furnished without jacket, if desired.

AIR COMPRESSORS

739 1—8"x8" Chicago Pneumatic 90 CFM at 100 lbs.; 81 CFM at 125 lbs.

1773 1—Chicago Pneumatic Air Compressor, 7½"x6", Capacity 75 CFM at 100 lbs. pressure.

1828 1—Sturtevant centrifugal air compressor capacity 2400 CFM with 15 H.P. A.C. motor.

BLENDER

1291 1—3'6" D x 5' cylindrical blender with stands, T & L pulleys.

BLOWERS

228 1—No. 3½ Acme low pressure blower, 128 cfm at 1 lb. pressure.

530 1—No. 2 Sturtevant Blower, 7" suc. 7" disch. Belt drive.

595 1—No. 5 H.P. Sturtevant Cupola, furnace and forge blower belt driven with 10 H.P. 220 volt, 60 cycle, 3 phase motor and manual starter.

1476 1—American Air Filter Rotocione blower, Type D, with 3 H.P., 3 phase, 220 volt motor.

1528 1—Denver Blower with 1½ HP, 3,600 RPM, 220/440 2 phase motor for use with furnace on item 1527.

1656 1—No. 3 Buffalo Blower.

1751 1—American Blower Exhauster Type ELS, 24" dia. wheel 15' intake, 12" x 13" discharge.

1781 1—American Blower, size No. 7, Sirocco Fan, 31800 CFM @ 1" S. P.

1782 1—Clarage Fan, Type W Class 2, 3750 c.f.m. @ 3" S. P.

1810 1—Victor Acme Type XAS size 55 belt driven blower

1827 1—Roots-Connersville No. 65 positive pressure blower with variable pitch texrope drive and 7½ H.P. A.C. motor.

BOILERS (STEAM)

808 1—Union Iron Works, 444 H.P. horizontal water tube boiler, 200 lbs. W.P.

1513 1—Cope 70 H.P. vertical steam fire tube boiler (125 lbs.)

1515 1—Automatic stoker for above boiler without motor.

1649 1—36" OD x 6' 10"—30 H.P. Vertical H.P. Boiler.

1698 1—7 H.P. Kane High Pressure Fire Tube Gas Boiler.

CENTRIFUGALS

100 1—38" D King and Gerber centrifugal (extractor)

1824 1—40" Perforated basket suspended rubber covered curb and basket with 20 H.P., A.C. variable speed motor.

CLARIFIER

925 1—No. 600 DeLaval Gasoline Multiple Clarifier, belt driven.

CONDENSERS

676 1—Elliott Brhart iron body surface condenser, 245 sq. ft.

1075 1—Goubert feed water heater or condenser, 330 sq. ft. heating surface.

1645 1—Alberger Condenser, 2 pass C.I. body, 500 sq. ft. with copper tubes. (2 ft. Dia. x 11 ft. high).

1646 1—Condenser 3' Dia. x 8' high Steel body.

1647 1—No. 2 Condenser 3' Dia. x 8' high steel body.

1764 1—10" D x 72" long steel tube condenser—50 sq. ft. surface.

1765 1—10" D x 60" long brass tube (¾") condenser. 50 sq. ft.

CARTON SEALER

1865 1—Automatic "CECO" Model A 3901-12 Barton Sealer with Motor.

CONVEYOR

1579 1—12" Vertical Bucket Elevator with 3 phase motor.

CRANES AND HOISTS

225 5—½ ton Link Belt electric hoists with 115 volt DC motors.

1164 1—Shepard Liftabout, Jr., ¼-ton capacity with 550 volt, 60 cycle, 3 phase motor.

1671 1—1 ton Detroit Electric—220V 3 phase Pendant control.

DRYER

1798 1—Buffalo Double Drum Dryer 32" Dia. x 90" Long.

DUST COLLECTOR

1498 1—Raymond Tubular Dust Collector.

FILTERS, FILTER PRESSES

386 1—Karl Kiefer clarifying filter on stand.

1571 1—24" x 24" Flush type and frame, radial grooved plate, 1 eye, open delivery, Sperry Filter Press.

1633 1—No. 12 Sweetland Pressure Filter, 36" Dia. leaves on 4" centers, with hydraulic closing and sluicing device.

1962 23—Sperry 36" Recessed Hebesite coated new filter press plates only.

FURNACES

1301 1—Lyndon Electric Furnace, complete with thermo couple, and controls, range 1,200 to 1,400 degrees. Inside dimensions 20" x 20" x 3'6" high.

1479 1—Sentry Electric Furnace, 2 circuit, 3 KW, 3 phase, size of hearth 12" x 18".

1480 1—Dispatch Electric Oven or Furnace, 20 KW. Size of hearth 18" x 18" with or without Foxboro Potentiometer Controllers.

Visitors To The Exposition

PHONE US

OUR CAR IS AT YOUR DISPOSAL TO BRING YOU TO OUR PLANT (½ HOUR) OVER NEW JERSEY'S "SKYWAY."

GUMMER

1733 1—Pony Labelrite table model motor driven gummer (6" rolls) with single phase motor.

KETTLES (NOT JACKETED)

79 1—6' D x 8' Deep vertical fabricated steel kettle with dished bottom and dished removable head. Butt strapped, ⅝" shell. 1,600 gallons capacity.

205 1—7'10" Dia.x6'8" Deep steel body with 2 banks of heating pipes. Not agitated. 2,400 gals capacity.

268 1—19½" D x 15" Deep, stainless steel with bolted cover, ⅝" thick. 2" bottom center outlet. 2" top center outlet. 1" pipe connection off center.

"Emsco Engineering" **PROTECTS YOUR INVESTMENT**

Equipment—a Guaranteed Sound in Every Sense of the Word . . .

679 1—6'9" D x 9' Deep C. I. Kettle with bolted cover, shaft, stuffing box, bevel gear, no drive or propellor.

905 1—Lehigh 8' x 10' C. I. Kettle with agitator, with C. I. conical draft tube and coil. 2" bolted cover. 3,000 gals. capacity. Several outlets.

948 1—2' Dia. x 2' deep, C. I. pot type kettle, closed top, with agitator, 10" manhole. Capacity 40 gallons.

1289 1—24" x 36" C. I. Reaction Kettle with bolted cover, agitator, stuffing box and shaft. 75 gallons.

1535 1—5' x 5' x 42" insulated tinned copper kettle with motor driven agitator coil. 650 gal. capacity. No motor.

1767 1—3' Dia. x 4' Deep C. I. Kettle with bolted cover, 175 gal.

KETTLES (JACKETED)

1273 1—4' Dia. x 2'6" Deep steel jacketed kettle with flat bottom; also jacketed, paddle type agitator and shaft, but no drive. Kettle of ¾" steel plate, solid construction. steel plate cover with 6" pipe vent, 250 gal. cap.

1321 1—60 gal. enameled Marmite (no cover) 32" D x 24" Deep on 3 C. I. legs, jacketed.

1327 1—C.I. jacketed 21½" Dia. x 18" Deep to flange, complete with agitator drive, T & L pulleys, glass lining not perfect. 25 gallon capacity.

1331 1—C.I. Jacketed with C.I. cover 25 gals. 28" dia. x 14" deep.

1334 1—C.I. jacketed C.I. kettle with cover, 4 flanged openings of various sizes and 1 hand hole opening with cover. No agitator or drive. 13.2 gals. cap.

1336 1—C.I. enameled kettle 40 gal. capacity, jacketed. 30" D x 18" Deep.

1344 2—5 gallon jacketed glass lined laboratory kettles—no covers.

1687 1—27" D x 22" Deep Copper jacketed lead lined on 3 legged stand. (DuParquet, Huot, Moneuse & Co.)

1815 1—40 Gal. Copper Jacketed kettle mounted on C.I. stand.

1834 3—New 65 gallon Dopp kettles.

MILLS (PULVERIZERS—CRUSHERS)

1042 1—Briton Hammer Mill with Blower, screen and 25 HP AC motor.

1421 1—Raymond No. 6000 Automatic Pulverizer, belt driven.

1435A-G Parts for 4½' x 16" Hardinge Conical Mill.

1437 1—Eli Blake 15" x 9" Jaw Crusher.

1446 1—6' D x 6' L Thropp Pebble Mill lined with silex blocks.

1496 1—No. 0000 Raymond Impact Pulverizer direct connected to 10 HP 3 phase motor.

1559 1—No. 0 Raymond Impact Pulverizer, mounted on stand with motor base plate for chain and sprocket drive.

1572 1—9" x 28" 3 Roller Mill, (Not water cooled).

1585 1—6' Dia. x 5' L porcelain lined Pebble Mill with T & L pulleys.

1639 1—Raymond No. 1 Pulverizer with ducts, exhaust fan & 6' Dia. cyclone.

1640 1—No. 1 Gruendler Hammermill with 7½ HP AC motor.

1642 1—No. 13 Quaker City Crusher.

1683 1—Gruendler 2 roll smooth crusher.

1717 3—Lehmann 5 Roller Water Cooled Mill 12" x 30".

1718 1—6' dia. x 20" deep Muller (stone lined) with heating coils.

1747 1—J. H. Day 3 roller water cooled mill, 16" x 40".

1776 1—Western "Bear Cat" Shredder Size 2A.

1907 1—15" Premier colloid mill with 50 HP motor.

1908 1—10 Premier colloid mill (no motor).

MIXERS

1106 1—Triumph Dough mixing machine, tilting type, 27" wide x 28" long x 31" deep, capacity 9 cu. ft. or 315 lbs. Flour 1½ barrels, with single phase motor and p. b. control.

1395 1—Sprout Waldron Grain Mixer 4' Dia x 4' straight tapered to 12" Dia., 4' in length.

1677 1—Double Ribbon Mixer, 22" x 70", wood cover, end discharge, belt drive.

1678 1—Multi-paddle Mixer, 15" x 24", center discharge, belt drive.

1709 1—20 Gallon Tilting Mixer (3 single paddles), T & L pulleys.

1761 1—J. H. Day 75 gallon jacketed sigma blade mixer.

1770 1—Readco 100 gallon tilting jacketed sigma blade heavy duty mixer.

1778 1—J. H. Day single arm mixer - no motor.

1831 1—J. H. Day "Hercules" 6 barrel capacity heavy duty mixer equipt with 2 HP AC tilting motor and 20 HP AC variable speed main driving motor.

1902 1—36" Dia. x 24" Deep Tub mixer with Patterson unipower drive.

MOTORS—ELECTRIC

New and used alternating motors from 1 H.P. to 200 H.P. in stock.

PUMPS

232 1—American Well Works, 4" suction x 3" discharge Centrifugal Pump, 2 stage, bronze impellers, closed type, motor driven 30 HP GE Motor. 110 gpm at 360 ft. head.

258 1—Wilfley 2" x 1½", 80/90 g.p.m. at 150 ft. head with 7½ HP AC motor.

755 3—Foster "Excelsior" Rotary Pumps, size 23, 35 gpm. 1½" suction, 1½" discharge.

904 1—Kinney 2" x 2" Rotary Pump, mounted on base.

931 1—2" x 2" Bronze Centrifugal Pump, for belt drive.

1111 4—Stokes slide valve type, 8" D x 7" stroke, 55 cfm, belt drive.

1197 1—Devine 10" x 10" 113 cu. ft. reciprocating rotary valve vacuum pump.

1276 1—4" x 6" Devine single phase vacuum pump, belt driven, T & L pulley. Capacity 13 cu. ft.

1302 3—Devine Rotary Valve Dry Vacuum Pumps, 52 cu: ft. displacement belt drive.

1304 2—Devine Rotary Valve Dry Vacuum Pumps, 113 cu. ft., displacement belt drive.

1310 1—Burckhardt Vacuum Pump 45 c.f.m.

1590 1—Leiman Size "G" Rotary Air Compressor and Vacuum Pump 2½" inlet & outlet. 148 CFM at 15" vacuum.

1619 1—1¼" Lewis Centrifugal pump with 3 HP AC motor.

1622 1—3" x 3" Goulds Centrifugal pump with 5 HP AC motor.

1623 1—3" x 3" Dayton Dowd Centrifugal pump with 5 HP AC motor.

1682 1—16" x 16" Blake and Knowles Vacuum pump, 600 CFM at 162 RPM.

1737 3—220 Blackmer Rotary Pumps, 20 GPM for direct connection.

1740 2—250 Blackmer Rotary Pumps, 50 GPM with 5 HP AC motors.

1743 1—7¼" x 4¼" x 10" Worthington Duplex Steam Pump.

1744 1—Worthington 7¼" x 5" x 6" Duplex Steam Pump.

SEPARATORS

896 1—18" Dings High Intensity Magnetic Separator with Falk Reduction drive and rubber belt. 110 Volt DC excitation.

1594 1—5' dia. Gayco Air Separator complete with 5 HP AC motor and drive.

STERILIZER

1792 1—Bramhall-Deane Steriliser. Inside dimensions 2'6" by 4' High by 7' long.

STILLS

561 2—George Ott large copper Brewer's Stills, 5' dia. x 4' top bonnet, 42" x 9' main body, 13' overall 580 gallon cap.

1362 1—Stokes Automatic Water Still. 10 Gals. per hour.

1407 1—2 Compartment still, horizontal, mounted on legs.

1734 1—5 Gallon American Water Still.

TANKS

We invite your inquiries on tanks. Our stock on open, closed, pressure, storage, vertical, horizontal, lined, unlined, welded, riveted, copper, steel, wooden, square and cylindrical tanks range from 10 to 43000 gal. cap.

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NEW & REBUILT EQUIPMENT

FOR IMMEDIATE DELIVERY

ABSORBER
HCL Alberger, comp. unit made of Karbate for 10-ton/day plant (UNUSED).

AGITATORS
Patterson, vert. Unipower 10 HP, X.P. motor, 56 RPM output.
Simplex Turbo 34" belt drive.

The following are all Unused:
Lightnin Mod. 33-50, S.S., ½ HP, X.P.
Lightnin Mod. 33-25, S.S., ¼ HP, X.P.
Lightnin Mod. 33G75, S.S., ¾ HP, X.P.
Lightnin Mod. 33G100, 1 HP., T.E.
Lightnin Mod. 33G100, S.S., 1 HP.
Patterson, S.S., 311 RPM, 1 HP T.E.
Eastern Mod. VS-2, S.S. shaft 1/3 HP.

AIR CONDITIONING UNIT
20 ton Frigidaire Unit.

AUTOCLAVE
Vert., jack'td. 6'x8', S.S. Clad, 40# WP, ASME Code.

BLENDERS
Copper, 20" dia., 20" deep, conical, M.D.
Conical, S.S., 7'8" x 10'.
Porter-Cable Double Cone, S.S., 26"x28", w/agitator.
Gedge Gray, 3'6"x10'.

BLOWERS & FANS
10000 CFM, 1.9" SP, Everdur Blades, Type R, Buffalo.
18000 CFM, 7¼" SP, Type SE, No. 12, American.
70000 CFM, 10" SP, Sturt., Turbo #2.

The following are all Unused:
Axial Flow Fans, 3000 CFM to 10000 CFM.
15000 CFM, ½" SP, N.Y. Blower, Type ME, Size 27.
53000 CFM, 1¼" SP, N.Y. Blower, Type ME, Size 49.
(Other Blowers from 1000 to 50000 CFM)

BOILERS
Dowtherm, 500,000 BTU, 125# pressure, Natl. Board, gas fired.

CARPULLERS
L.B., 5000# cap., 5 HP motor.

CENTRIFUGES
Bird Centrifugal, S.S., 48" bottom discharge.
International 13 litre serum, M.D.
Sharples Vaportite #16, contact parts, S.S., motor driven.

COAL PULVERIZERS
UNUSED Babcock & Wilcox Model E35, 9000#/hr. 57 grindability. Mfg. 1947.

COMPRESSORS
L.R. Centrifugal, 4 stage, single flow, 6500 CFM, 10#, M.D. (unused).
Fuller, rotary, Type C-300, single stage.
Frick, Ammonia, 4x4, Type G.

CONDENSERS
Karbate, 6"x60".

CONVEYORS
Stainless Steel belt 32" x 65' cc.
Link Belt, flat, 24" x 30' cc.
Rapids-Standard Portable, 16"x15', Mod. RPB-C-1516, complete.

CRUSHERS & MILLS
Abbe, 4-cage, 22"x12".
Abbe, Size B, Grinder.
Micro No. 2 Hammermill.
Williams Hammermill No. 3.
Jeffrey A2, 36"x24", Swing Hammer.
Stedman Mill, 4-cage, 36".
Day, Paint Mill, 3-roll, 16"x40".
Abbe Ball Mill No. 150, 3'7"x3'8".
Abbe Ball Mill, 38"x38".
Fall Mill, 5'x6', chrom-mang. Type DJX.
Ball Mill, 6'x16', chrom-mang. 50# W.P.

DIESEL GENERATORS
60 KW G.M. 6-71RC, 3/60/127-220, Used only 100 Hrs. New 1946.
100 KW Hercules DNX-6, 3/60/127-220. Unit completely enclosed. New 1944.
100 KW Superior GDB-8, 120/240 DC, complete. New 1942-3.

DUST COLLECTORS
Birmingham, Cyclone, 8'x4'2", 10000 CFM.
Dracco Automatic Filter Unit 3# 20-S, Multi-bag section (UNUSED).

ELEVATORS—BUCKET
Webster 48' MI Buckets 14"x7".
Jeffrey 68' MI Buckets 10"x6".

FEEDERS—VIBRATING
Syntron Type F33.
Jeffrey 18"x36".
Allis-Chalmers 36"x12"x6'.

FILTERS
3'x4' Oliver, continuous, wood drum.
5'4"x6' Oliver, continuous, wood drum.
8'x10' Oliver, continuous, wood drum.
8'x10' Oliver, precoat bronze drum.
8'x10' Oliver, continuous, all iron.
Sweetland No. 12, 72 leaves, 2" spacing.
Sweetland No. 12, steel nickel chrome alloy.
Shriver 36", 50 Celoron Plates & Frames.

GAS PURIFICATION SYSTEM
Complete with tanks, valves, piping. Cap. 2000 to 16,000 cu. ft. per hour.

KILNS & DRYERS
8'x125'x3⅛" Vulcan.
7'x45'x½" Link Belt.
5'x50'x7/16" Mosser.
4'x30'x⅜" Traylor.
3'10"x16' L.B. Roto Louvre.

MIXERS
No. 3 Super Ajax, 173 gals.
Type E, Size 2, Champion, 110 gals.
1½ SA Readco, 88 gals.
Blystone, heavy duty, 4'x6'7".
W. & P. Kneader, 33"x40"x30".

MOTORS
Large quantity of NEW T.E. and X.P. from ½ to 150 HP.

PACKAGING EQUIPMENT
Battle Creek Wrapping Machine, CL. M.D.
Popper & Klein S.S. automatic Vial Filling, 2 demountable measuring heads for filling 4CC and 20CC vials.

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Haveg, 2" to 24".
S.S. Tubing ¾" to 10¼" (UNUSED).
Copper ⅛" to 18" (UNUSED).

PUMPS
Centrifugal—from 20 to 2,500 gals.
Vacuum, Stokes, 212C, 100 CFM.
Nash Hytor #4.

REDUCERS
¼ to 100 HP, Ratio 4-1 to 2064-1.
1 to 7½ HP, Vari-Speed, 2-1 to 6-1.

STACKS
5'3"x110', welded, 5/16" & ⅜".
42"x37' high 5/16" & ⅜".

TANKS
2000 gal. 5'x14' ASME, 263# WP.
2200 gal. 7'x8'x¾" Wax Heating agit.
2300 gal. hor. 5'x15'2"x½".
3000 gal. hor. 6'6"x10'x5/16" ASME.
3200 gal. hor. 6'3"x14'2"x⅜", glass lined and insulated, for syrups, food products.
3200 gal. vert. 8'x8'x5/16".
4000 gal. hor. 6'6"x16'x¼" & 5/16".
4000 gal. hor. 6'x20'3"x5/16" (NEW).
4900 gal. vert. 10'x8'x5/16".
5000 gal. hor. 6'1"x24'x½".
5200 gal. vert. 9'5"x10'x¼".
41000 gal. vert. 12'6"x45'x¼" & 5/16".

TRANSFORMERS
1 to 1500 KVA, All Voltages.

WELDERS
300 & 400 amp. G. E. & Hobart.

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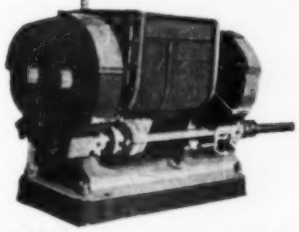

SPECIAL: W. & P. style heavy duty double arm, jacketed Mixers, geared at both ends; 100 gal. working capacity; this month only, $1950.

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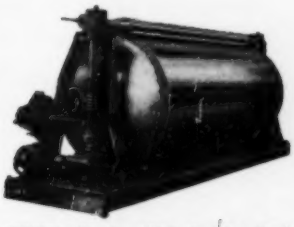

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Stainless Steel Jacketed Vacuum Pan 4' x 5'
3 Stainless Steel Pressure Vessels; 3' x 5', 4' x 5' and 5' x 8'
Stainless Steel Still 51" x 58" with accessories
Bartlett & Snow Stainless Pan Dryer 7'10" x 2'11"
3 Stainless 5000 Gal. Closed Top, dished manhole style BRAND NEW Tanks; 10' x 7'9"
3 Stainless Open Top Jacketed Tanks; 880 gal. 65" x 68"
Stainless Steel Resin Still 8' x 7'; agitated; coil heated Jacketed Agitated Hi-Pressure Autoclaves
3500 Gal. 6' x 21' 300 PSI
250 Gal. 4' x 5' 350 PSI
50 Gal. 2' x 2½' 350 PSI
Steel Sulphonator 7' x 7½'; Jacketed and Agitated
5 Steel Fusion Pots 4' x 3' with anchor type agitators
4 BRAND NEW 1600 Gal. Vertical Vacuum and Pressure Tanks 66" x 120"
2 Pfaudler Glass Lined Vacuum Pans; 500 gal. and 2500 Gal.
Copper Rectifying Column by Vulcan, 24" x 36' with 50 plates each plate having 10 bubble cups
Forced Circulation Evaporators with Inconel and Karbate Heat Exchangers and accessories (1270 sq. ft.) and (1100 sq. ft.)
2 A. O. Smith Rotary Vacuum Dryers 7'6" x 20' with auxiliaries
BRAND NEW Devine 4' x 12' Rotary Vacuum Dryer
Stokes Nickel Rotary Vacuum Dryer 3' x 5'
2 Struthers Wells Stainless Steel Drum Dryers or Flakers 5' x 10'
Buflovak Double Drum Dryer 32" x 72" with 5 H.P. motor and auxiliaries
2 Proctor & Schwartz Conveyor Type Dryers, 78' and 102'
6 Louisville Steam Tube Dryers from 5' x 25' to 6' x 50'
4 Louisville Screw Type Dewatering Presses
3 BRAND NEW Sperry 42" Aluminum Filter Presses, 34 chamber
6 Cast Iron 36" Plate & Frame Filter Presses; 45 chambers
7 Devine and Stokes Vacuum Chamber Dryers from Lab. size to Double Door Model No. 23, some with auxiliaries
Pittsburg Lectro Dryer No. 250
Kent, Ross & Day Three Roller Mills 12" x 30" and 16" x 40"
Farrell Birmingham Rubber Mills from 24" to 84"
Farrell 3 Roll Calendar 18" x 54" complete with accessories
Heavy Duty Double Arm Jacketed Mixers; 15 to 150 gal. geared both ends
Jacketed Double Ribbon Crystallizer; 28" x 42" x 16'
Readco Jacketed Very Heavy Duty Double Ribbon Mixer; 30" x 33" x 68"
Wolfe 5000 lb. Double Ribbon Mixer; 50" x 54" x 114" long
3 Porter 370 cu. ft. Double Ribbon Mixers; 5½' x 5' x 16' motorized
J. H. Day Ro-Ball Sifters; 2 or 3 separations; 40" x 120"
8 Copper and Steel Evaporators with copper tubes; Diameters from 5½' to 10'8" and overall height from 12' to 21'
10 Stainless Steel Centrifugal Extractors from 12" to 60"
2 Buhrstone Lined Pebble Mills, 4' x 5' and 6' x 5'
2 Patterson Chrome Manganese Lined Ball Mills; both jacketed sizes 5' x 6' and 5' x 16'

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2 Louisville Steam Tube Dryers 5' x 25'.
4 Louisville Screw Type Dewatering Presses.
5 Sterling Boilers 275 HP to 512 HP.
2 Jones Stokers.
5 Steel Grain Tanks 9½' x 9½', 11' x 7'.
8 Steel Cook Tanks, Jkt'd. and Agitated, from 5' x 5' to 9½' x 18'.
6 Copper and Steel EVAPORATORS
Single, Double and Triple Effect
5'6" x 12'—486 tubes.
9'4" x 18'—1612 tubes.
7' x 16'10"—1712 tubes.
10'8" x 21'—2400 tubes.
7'11" x 17'6"—1734 tubes.
6 Heavy Copper Tanks from 2,000 to 6,000 gal.
Bauer 36" Attrition Mill with two 50 H.P. motors.
2 Filter Tubs, 12'—18' dia.
3 Grain Mills, 9" x 24"—40".
Fairbanks and Howes Hopper Scales from 10 ton to 30 ton.
Large quantity of Screw Conveyor, Bucket Elevator, Bins, Hoppers, Steam Pumps, Centrifugal Pumps, Vacuum Pumps, Deep Well Pumps, Steam Turbines, Air Compressors, Grain Cleaners, Hop Breakers.
Large Lot of Can Conveyors, Dust Collectors, Fans, Blowers, 4 Redwood Feed Water Tanks, 16,000 gal.
Dry Packaging Equipment.
Miscellaneous Factory Handling Equipment, Motors, etc.

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10—Rass Eng. 2-truck Atmospheric Dryers, steam heated, 500 sq. ft.
2—Proctor & Schwartz 10 and 6 section single conveyor Dryers.
3—Louisville 6'x50', 6'x40', 6'x25' Rotary Steam Tube Dryers.
2—Buflovak 5'x12', 5'x4' Atmospheric Single Drum Dryers.
2—Buflovak 48"x40", 24"x20" Vac. Drum Dryers.
3—Devine, Stokes 30"x8', 4'x20', 5'x30' Rotary Vac. Dryers.
1—Ruggles-Coles 70"x35" ind. heat Rotary Dryer
6—Allis-Chalmers 9'6"x250', 7'6"x 125', 9'x80' Rotary Kilns.
1—Devine 3'x14' stainless clad Rotary Dryer.
1—Spray Dryer S.S., 6' chamber
1—Devine #23 double door Vac. Shelf Dryer, 13—59"x78" shelves.
3—Sweetland Filters #10 and #7.
4—Sweetland Filters #2 Stainless Steel.
7—Oliver Rotary Vac. Filters 11'6"x 18', 8'x8', 6'x3'
2—Eimco Rotary Vac. Filters 4'x6', 1½'x6'; stainless.
20—Shriver cast iron P&F and Recessed Filter Presses, 12", 18", 24", 30", 32", 36", 42"
1—Shriver 18" P&F Aluminum Filter.
10—Wood Plate & Frame Filter Presses 18" to 42".
15—Filter Press Skeletons 18" to 42".
1—DeLaval Starch-Gluten Separator.
2—Eimco 6' and 7' Disc Filters.
1—Tolhurst 40" m.d. Suspended Centrifugal with monel basket.
3—Tolhurst and AT&M 20", 30" and 32" Suspended m.d. Centrifugals, steel baskets.
2—A.T.&M. 48" and 40" Suspended centrifugals, S.S., imperforate baskets.
1—Sharples #16V stainless, m.d. Centrifuge.
1—Bird 18"x28" Solid Bowl Continuous Centrifugal, monel construction.
3—Abbe and Patterson 6'x8', 5'x6', 5'x4', 45"x42'. Porcelain lined, jacketed Pebble Mills.
8—Pebble Mills 5'x6', 4'x5', 3½'x4', 3'x4', 3'x3', 2'x3', porcelain and silex lined.
2—Marcy 5'x10', 7'x5' Ball Mills.
5—Mikro Pulverizers ZTH, 15H.
4—Jeffrey 36"x60", 30"x24" Hammer Mills.
5—William #24, #5 Hammer Mills.
2—Fitzpatrick Comminuting Machines, stainless.
2—Simpson Intensive Mixers #0.
5—Day 16"x40", 12"x30", 9"x24" 3 roll Paint Roller Mills.
6—Baker-Perkins Steam Jacketed Double Arm Mixers, 150, 100, 50, 2, 1 gal.
2—Baker-Perkins Vac. Steam Jacketed Double Arm Mixers, 100 gal., 4½ gal.
20—Batch Powder Mixers, all makes, 100 to 3000 lbs. steel & S.S.
15—Lead Pony Mixers, 100 to 8 gal.
2—Anderson #1 Expellers, m.d.
6—Day, RO-Ball and Retex, #81 and 82, single and double deck, stainless steel screeners with 40"x120" screens.
4—Retex 40"x56" and 20"x48".
10—Tyler-Hummer Screens, 3'x15', 3'x10', 4'x5', 3'x5', with thermionic units and controls.
1—Glasscote 1000 gal. glass-lined, jacketed, agitated Reactor.
2—Buflovak 6' dia. Crystallizers.
6—Swenson 20' Sections Continuous Crystallizers.
1—Mojonnier S.S. 2-effect Evaporator, 725 sq. ft.
3—Evaporators Triple & Quad. Effect, 3600, 8000 and 10,000 sq. ft.
4—7'6"x8'6" S.S. Reaction Kettles.
1—Sugar Mill 750 ton, 5' mill.

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New Baker Perkins, 100 gallon, *chrome plated*, double arm jacketed mixer 20 HP explosion proof AC motor, hydraulic tilt
New Pfaudler 750 gallon "LL" series, jacketed vacuum still
New Bird 40" suspended centrifuge, *rubber covered*, basket and curb MD
Lancaster No. 4 *stainless steel* construction, 9 cu. ft., 10 HP motor
New 100 gallon *homogeneous lined* still jacketed with 66 sq. ft. lead condenser
New Swenson *monel* single effect evaporators, karbate tube sections
Dorr 3' x 40' *rubber lined* classifiers with explosion proof motors
New Glascote 2000 gallon jacketed and agitated still
New Struthers Wells 100 gallon *nickel clad* agitated vacuum still
Hardinge 4' x 14'6" *granite lined* continuous mill with 40 HP motor
Abbe & Patterson 30 and 250 gallon *porcelain* lined pebble mills
Ion Exchange unit, *rubber lined* tanks, 22½ cu. ft. of resin
Swenson triple effect evaporators
Hastelloy 1000 gallon convertor, coiled
New 30" x 37' bubble cap column
New Badger type 347 stainless steel tanks, 5000 to 20,000 gallons
New W & P 2.6 gallon sigma bladed unjacketed *stainless steel* mixer XP motor

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AGITATORS & MIXERS

1—Turbo #4B Vert., 57½ RPM, 20 HP
1—Lightnin Side Ent. 10 HP
1—Patterson Side Ent. 5 HP
30—Portable ¼ HP to 1 HP; 400, 1725 RPM
6—Double Arm, heavy duty, Jkt'd., 25 gal. to 250 gal.
5—Dry Powd.—50# to 3500#
1—Day Hor'z. Spiral, Jkt'd., 170 gal.
6—Lead & Paste, Floor type, 800 gal.

CENTRIFUGES & CENTRIFUGALS

2—Sharples #16V Super-Cent.—Stainless
1—Sharples #18V Super-Cent.
2—DeLaval #600 Cent. Separators
1—DeLaval #AC-VO
8—Basket type—Susp. & Bot. Drive—various sizes

COLUMNS & TOWERS

4—Stainless Steel Bubble Cap, 8' dia. x 30' high, 20 plate
1—Stainless Steel Bubble Cap, 6'6" dia. x 59'6" high, 29 plate
1—Copper Bubble Cap, 30" dia. x 30' high, 20 plate
1—Copper Bubble Cap, 18" dia. x 27'6" high, 28 plate
1—Copper Sieve plate, 30" dia. x 25' high, 14 plate
2—Stainless Spray Towers, 33" dia. x 17' high

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Large stock of Fillers for liquids, powders and pastes; Cappers and Cap-Tightners; Wrap Around and spot Labelers for bottles and cans; Bottle Rinsers and Air Cleaners; Case Gluers and Stitchers, Belt Conveyors and Conveyor work tables; Gravity Conveyors. Complete automatic and semi-automatic lines.

COMPRESSORS & BLOWERS

2—Ing. Rand Blowers 4000 CFM @ 3#
2—Spencer Turbine Gas Comp., Stainless Steel, 30 HP mot., 600 CFM @ 80 oz.
1—Ammonia Comp. 3" x 3", 3 HP
1—Ing. Rand Air Comp. 6 x 5, 10 HP

DRYERS

1—P&S Atm. Tray, 1030 sq. ft., 4 ch., steam heated
3—Vac. Shelf, 72 to 245 sq. ft.
3—Hevi-Duty Elec. Furnaces, 750° C
5—Atm. Double Drum, 32" x 38", 28" x 60", 32" x 102"
1—Atm. Twin Drum, 32" x 52"
2—Vac. Drum—30" x 36"
5—Rotary Hot Air—1' x 15', 3' x 20', 4'6" x 12', etc.
6—Rotary Steam Tube—4'6" x 25', 5' x 25', 6' x 30', 6' x 50'
3—Jkt'd. & Agit. Pan Dryers, 5' dia. x 30"; 9' x 6" dia. x 36"
1—Davenport Rot. Grains Press—size 3A
2—Louisville Cont. Roller Presses—24" x 36"

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1—Stainless, Tub., 10 sq. ft.
1—Stainless, Tub., 323 sq. ft.
6—Steel, Tub., 31 sq. ft.
6—Copper, Tub., to 300 sq. ft.
8—Double Pipe Coolers or Exch.
1—Brine Cooler, 400' coil

EVAPORATORS

1—Lawrence Triple Eff., 5000 sq. ft.
1—Single Eff., steel, 33 sq. ft. coil
1—Copper Vac. Pan, 6' dia. x 10' high, with Jkt'd. coils and condenser
2—Copper Vac. Stills, 4' dia., spherical, Jkt'd. & agit.
1—Struthers Wells, Tub., 4' x 8'

FILTERS

1—Swenson Rot. Vac. Precoat, 8' x 8', acid proof rubber cov. and lead
1—Feinc Rot. Vac. String Disch, 10'6" dia. x 16' face
—Rot. Vac. Steel: 6' x 3', 8' x 44", 8' x 12'
1—Sweetland #10, 500 sq. ft., C.I. body, bronze leaves
1—Klein #3, 237 sq. ft., stainless—unused
2—Klein #2, 200 sq. ft., stainless—unused
2—Sparkler 33-D-12, stainless
3—Bowser #0, #1, #2, Press. leaf
1—Shriver 30" Wood P&F, 24 ch. open
2—Shriver, 24" C.I. P&F, 54 ch. open
1—Sperry 24" C.I. 15 Rec. Pl. open
1—Shriver 12" Wood P&F, 12 ch. cl. dely
1—Sperry 12" C.I. P&F, 10 ch. cl. dely
1—Sperry 10" C.I. P&F, 1 ch. cl. dely.

KETTLES & REACTORS

1—Glascote Glass lined, 75 gal., Jkt'd. & agit, clamped cover
1—Pfaudler Glass lined, 50 gal., Jkt'd. & agit.
1—Monel, 100 gal., Jkt'd. & agit., vac. cover
3—B45 Stainless, 630 gal., open top, direct fired, heavy duty agit.
1—Stainless, 2500 gal., closed, coils & agit.
6—Stainless, open top, Jkt'd., 50 gal., 100 gal., 150 gal., 300 gal., 500 gal.
16—Stainless Clad, open top, Jkt'd., 60 gal., 75 gal., 80 gal.
1—Aluminum 1000 gal., closed, Jkt'd., coils & agit.
1—Aluminum 100 gal. closed, Jkt'd. & agit.
3—Aluminum, open top, Jkt'd., 20 gal., 40 gal., 100 gal.
1—Lead Lined 500 gal., Jkt'd., coils & agit.
1—Lead Lined 700 gal., closed, Jkt'd. & agit.
8—Copper, open top, Jkt'd., 30 gal. to 250 gal.
1—Copper, 1900 gal., with coils
1—Dopp, 300 gal. Cast Iron, Jkt'd. & Agit.
2—Cast Iron, 75 gal., open top, Jkt'd.
2—Steel, Jkt'd. & Agit., open top, 650 gal., 800 gal.
4—Steel, Jkt'd. & Agit., closed, 100 gal.

MILLS

1—Allis Chalmers Cont. Ball Mill, 6' x 7', steel liner, steel balls, 250 HP mot.
2—Abbe Pebble Mills, 6' x 8', buhrstone lined
2—Abbe 6 Day double jar Mills
1—Pebble Mill, Stainless Steel, 21" x 28"
6—Attrition Mills, single & double, 18", 22", 30"
2—Williams #1 Hammer Mills
4—Mikro Pulverizers—Bantam, #1, #2
2—Colloid Mills, 6", stainless
3—Ross 3-roll Ink or Paint Mills, 18" x 40"
1—Thropp 2-roll Rubber or Plastic Mill, 6" x 12"

PRESSES

3—Stokes Rotary 16 punch Tablet Presses
2—Colton #2—16 punch tablet presses
6—Single punch tablet presses, var. sizes
1—Davenport Grains Press #3A
2—Louisville Roller Presses, 24" & 36"

PUMPS

6—Stainless Centrif. 3", 300 GPM @ 30'
8—Stainless Sanitary Centrif., Tri-Clover #2EI, #2EBH, #2½ EH—Unused
5—Duriron Centrif. 2" x 1½", 80 GPM @ 45', 40 GPM @ 60'
1—Ing. Rand Bronze Centrif. 850 GPM @ 140', 40 HP mot.—Unused
2—Ing. Rand Bronze Centrif. 200 GPM @ 230', 20 HP mot.
30—Bronze Centrif., 3" x 2½", 180 GPM @ 55' or 260 GPM @ 45'—Unused
1—Allen-Sherman Hoff Hydrosecal Slurry, 4"
14—Aurora Bronze Turbine type: F-4, I-4A, I15, G-6, H-6

STILLS

1—Jewell Water—250 GPH
1—Copper Vac., 100 gal., Jkt'd., & agit.
1—Copper, 500 gal., Jkt'd. w/condenser
2—Gas-fired copper vac. 40 gal. & 130 gal.
5—Copper "Bear" Stills—var. sizes

TANKS

3—Stainless T347, 3450 gal., vert., bolted top, 9' dia. x 7'3" high, coils
4—Stainless, T304, horiz., dished heads, 1000 gal. & 1800 gal.
5—Stainless T304, vert-open top, 150 gal.
1—Stainless T430, horiz., 6300 gal., 6' x 30'
2—Aluminum, closed, 600 gal. & 1000 gal.
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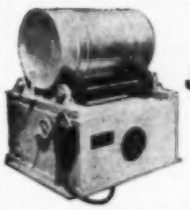

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200	Reliance	Drip	1800
200	Reliance	Drip	1200
150	Reliance	TEFC	1200
150	Wmse.	Open	1800
125	Wmse.	Open	3600
125	Reliance	TEFC	1800
125	Reliance	Open	1200
100	Reliance	TEFC	3600
100	Cent.	Expl. Pf.	1200
100	Reliance	TEFC	1200
100	G. E.	Drip	1800
75	Reliance	TEFC	900
75	Reliance	TEFC	1800
75	Reliance	TEFC	1200
75	Reliance	TEFC	900
60	G. E.	TEFC	1800
60	Reliance	TEFC	1200
50	Reliance	TEFC	1200
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500	Allis. Ch.	ANY	450
300	G. E.	I-M	1800
300	Allis. Ch.	ANY	720
300	Allis. Ch.	ANY	514
200	Allis. Ch.	ANY	720
200	G. E.	I-M	600
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150	G. E.	I-M	600

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C. E.

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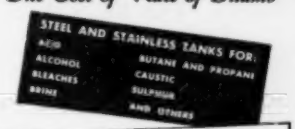
All POSEY Bids:
The Cost of "Rule of Thumb"



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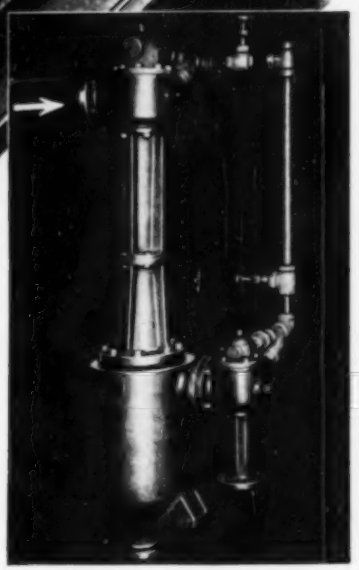

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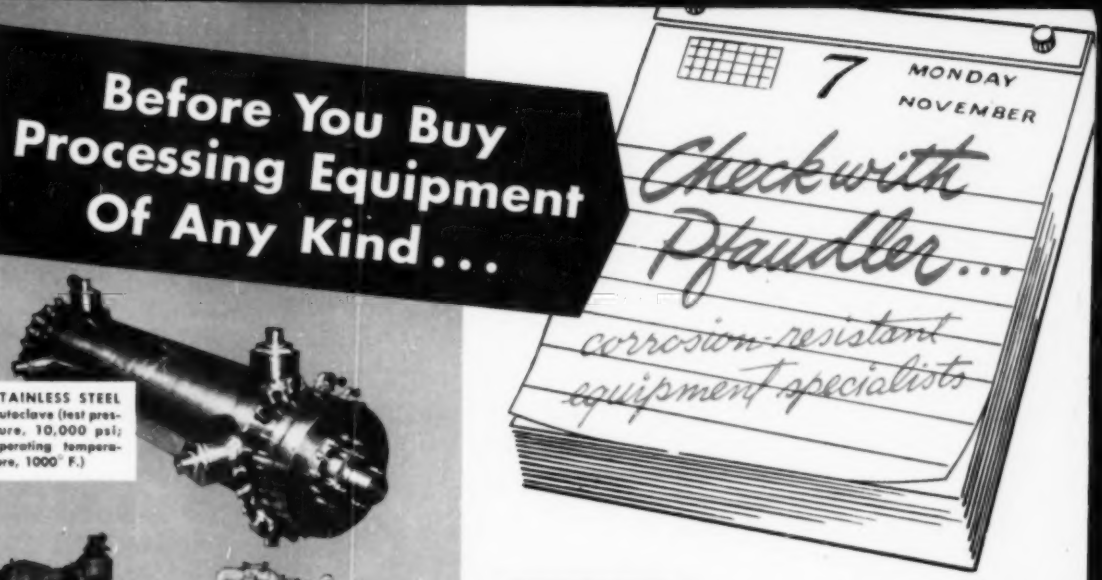
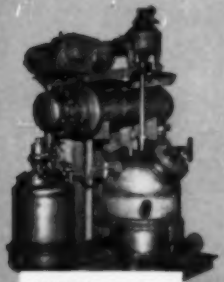
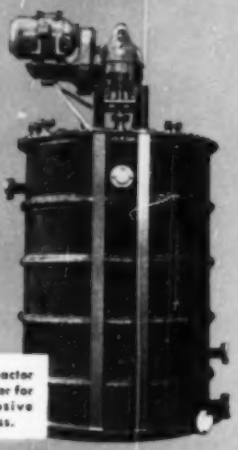


STAINLESS STEEL autoclave (test pressure, 10,000 psi; operating temperature, 1000° F.)



NICKEL reaction equipment intended for processing pharmaceuticals.



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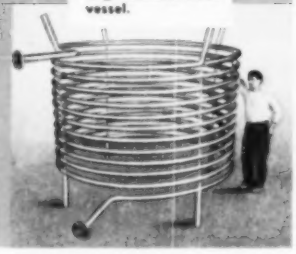
GLASS-LINED STEEL reactor for processing highly corrosive acids.

STAINLESS STEEL cooling coil for large stainless steel vessel.



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